D6.1 Report on the evaluation of specific congenital anomaly coding in health care databases including a computer algorithm to improve these codes

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Participants in WP6 Deliverable D6.1	UMCG University Medical Center Groningen Dr Marian K Bakker, Dr Hermien EK de Walle UNIFE Università degli Studi di Ferrara Dr Gianni Astolfi, Dr Amanda J Neville, Dr Cecilia Martellucci, Dr Elisa Ballardini SGUL St George's, Univeristy of London Prof. Joan Morris
Lead Author's Contact Details	Dr Marian Bakker m.k.bakker@umcg.nl +31 50 3617114 Dr Amanda J Neville nvm@unife.it +39 0532 237384
Project Website Address:	https://www.eurolinkcat.eu/

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Partners in WP6

Acronym, (partner's number)	Partner/Registry	Contributors
SGUL; QMUL (1;23)	St George's, University of London; Queen Mary University of London	Joan Morris, Elizabeth Limb, Joachim Tan, Jo Brigden, Hugh Claridge
UU (2)	Ulster University	Maria Loane, Joanne Given, Leke Aminkeng
RSD (3)	Denmark: Funen / Odense	Stine Kjaer Urhoj, Ester Garne
UNEW (4)	Newcastle University	Judith Rankin
UNIFE (5)	Italy: Emilia Romagna	Amanda Neville, Gianni Astolfi, Cecilia Martellucci, Elisa Ballardini
KDB (6)	Croatia: Zagreb	Ingeborg Barišić
CNR-IFC (7)	Italy: Tuscany	Anna Pierini, Michele Santoro, Francesca Gorini, Alessio Coi, Silvia Baldacci
UMCG (8)	Northern Netherlands	Marian Bakker, Renée Lutke, Nicole Siemensma-Muhlenberg, Hermien de Walle
PHW NHS, SU (9, 22)	UK: Wales	David Tucker, Ieuan Scanlon
FISABIO (11)	Spain: Valencian Region	Clara Cavero-Carbonell, Oscar Zurriaga, Laia Barrachina-Bonet, Laura García-Villodre, Ana Ruiz
THL (13)	Finland	Sonja Kiuru-Kuhlefelt, Anna Heino, Mika Gissler
	Wessex	Diana Wellesley
	Thames Valley	Jennifer Kurinczuk
	East Midlands and South Yorkshire	Elizabeth Draper

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Summary

Background Electronic health care databases (EHCDs) are increasingly being used to investigate the epidemiology of congenital anomalies (CAs), often due to the absence of a CA register. However, because EHCDs, are not designed for research or surveillance, their data on CAs may be inaccurate and incomplete.

Aim In this EUROlinkCAT study we aimed to evaluate the accuracy and the quality of the coding of CAs in hospital databases, compared to EUROCAT data which was assumed to be the gold standard. We aimed to ascertain which CAs can be accurately identified using EHCDs. We aimed to use the experience of people working in congenital anomaly registries to enhance an existing algorithm that optimises the use of data from EHCD in CA surveillance.

Methods Eleven EUROCAT registries Tuscany (Italy), Emilia Romagna (Italy), Valencian Region (Spain), Wales (UK), Finland, Wessex (England, UK), Thames Valley (England, UK), East Midlands & South Yorkshire (England, UK), Zagreb (Croatia), Northern Netherlands (the Netherlands) and Funen (Denmark) linked their CA data to regional or national hospital databases. Inclusion criteria for this study were all live birth born between 2010-2014, recorded in the EUROCAT registries and linked to hospital data (EUROlinkCAT cases) and all children identified in the hospital databases with a CA code registered in the first year of life. We focused on 17 specific anomaly groups, selected according to one of the following characteristics: anomalies detectable at birth, anomalies with a high prenatal detection rate, anomalies diagnosed after discharge from the maternity unit, anomalies that present in variable form between normal and abnormal, chromosomal anomalies and mild anomalies. For each child we compared the diagnosis codes in the hospital database to the codes in EUROlinkCAT and calculated the sensitivity and positive predictive value (PPV) for the specific anomaly groups. For a specified CA, the exact sensitivity is the proportion of EUROlinkCAT children correctly identified in the hospital data with exactly the same CA code as they have in EUROlinkCAT (EUROlinkCAT anomaly coding is being considered as the gold standard). A high exact sensitivity means that most of the EUROlinkCAT cases are correctly identified in the hospital database as having the same CA. High sensitivities are expected for CAs that require hospitalisation. For a specified CA, the exact PPV is the proportion of children in hospital data correctly identified in EUROlinkCAT with exactly the same CA code as they have in the hospital data. A high exact PPV means that most of the hospital cases with a CA code did have the anomaly (as judged by being identified in EUROlinkCAT with exactly the same CA).

A questionnaire was developed and circulated to all EUROCAT registries to identify how registries currently used data from EHCDs and to identify any algorithms. A workshop on the use of healthcare

databases for CA identification was convened to obtain more detailed examination of an existing Italian algorithm and the results were used to suggest improvements to the existing algorithm.

Results All registries linked more than 85% of their cases to hospital data, apart from Zagreb who only linked 58% by hand and Wales who only linked 73% as they included births from 1995 to 2014. The proportion of linked EUROlinkCAT cases with a CA code recorded in the hospital data in the first year of life varied from 49% in Zagreb to 96% in Valencian Region.

For anomalies detectable at birth, exact sensitivity was highest (> 90% in most registries) for cleft lip with or without cleft palate, and for abdominal wall defects (gastroschisis and omphalocele). For anomalies with a high prenatal detection rate, exact sensitivity was highest for hypoplastic left heart syndrome (HLHS), 100% in Tuscany and ≥90% in Emilia Romagna, Wales and Finland, but lower for unilateral renal agenesis and limb reduction defects. Isolated anomalies usually diagnosed after discharge from the maternity unit showed high exact sensitivity for Hirschsprung's disease (>90% in all registries). Anomalies with a variable form between a normal and abnormal finding and mild anomalies showed in general lower and variable exact sensitivity compared to the other anomaly groups. Eight registries showed high (>90%) exact sensitivity for Down syndrome.

PPV was calculated for six registries that had access to the full hospital database: Emilia Romagna, Valencian Region, Wales, Finland, Northern Netherlands and Funen. For anomalies detectable at birth, the exact PPV for orofacial clefts was high in five registries (exact PPV 83% - 96%). Exact PPV for gastroschisis was almost 100% for five registries. Exact PPV for the three selected anomalies with a high prenatal diagnosis rate showed variation in registries. Exact PPV for anomalies diagnosed after discharge from the maternity unit was highest for Hirschsprung's disease and VSD (>80% in three registries). It is noticeable that exact PPV for anomalies that present with variable form between a normal and abnormal finding was among the lowest compared to the other anomaly groups. Down syndrome showed high exact PPV (>90% in five registries).

Improvements to the existing Italian algorithm were made.

Discussion This is the first study to investigate the validity of hospital coding of specific CAs in several European hospital databases, using EUROCAT as the gold standard. In most registries exact sensitivity was high (>80%) for cleft lip with or without cleft palate, Down syndrome and Hirschsprung's disease. Low exact sensitivity (<50%) was frequently observed for clubfoot and congenital hydronephrosis. Exact PPV was high (>80%) for gastroschisis and Down syndrome and low (<50%) for ASD. The comparisons between CA coding in hospital databases and the coding in EUROlinkCAT highlighted differences between the hospital databases, often due to differences in the healthcare systems. Also,

the set up and purpose of the hospital database, including coding practices, affected the sensitivity and PPV.

Conclusions and recommendations There are important limitations in the use of EHCD to monitor the prevalence of CAs. Information is lacking in hospital databases on terminations of pregnancy, children with CAs that do not require hospitalisations and children with CAs that are treated in specialist centers outside the region of coverage. There is often limited information on related factors. In the absence of a CA register, hospital data may be used to monitor certain CAs with a high sensitivity and low TOPFA rate, but additional data sources should be used to capture information on CAs with a low sensitivity. The details of an algorithm that obtains the maximum amount of accurate information from these electronic health care databases is provided in this report. Its use is recommended in areas not covered by a CA registry, and also in regions where a CA registry exists, and hospital data can be an additional source for active searching of CA cases, not otherwise reported to the CA registry.

Lay summary

In this part of the EUROlinkCAT project we compared the diagnosis codes recorded in the hospital databases for CAs to the diagnoses registered in EUROCAT data. Eleven European congenital anomaly registries, which are part of the European Surveillance of Congenital Anomalies network (EUROCAT), successfully linked their records of children with congenital anomalies to regional and national electronic hospital databases. For seventeen specific CAs, we compared what proportion of children from the EUROCAT registries were registered in the hospital databases with the exact CA code (sensitivity). We also compared the proportion of children with a CA code recorded in the hospital data that were registered in EUROCAT data with the same CA code (positive predictive value). Our analyses showed that a high proportion of EUROCAT cases with cleft lip with or without cleft palate, Down syndrome and Hirschsprung's disease were recorded in the hospital database with the exact code for these anomalies, but that a low proportion of EUROCAT cases with clubfoot or congenital hydronephrosis were recorded in the hospital databases. We also found that a high proportion of children recorded in the hospital database with gastroschisis or Down syndrome were registered in the EUROCAT data with the same CA code. However, the majority of children for which an ASD code was recorded in the hospital data, were not registered in the EUROCAT data. Results differed per registry and hospital database. Hospital databases are limited in monitoring CAs as the quality of CA coding is variable and information is lacking in hospital databases on terminations of pregnancy, children with CAs that do not require hospitalisations and children with CAs that are treated in specialist centers outside the region of coverage. Limited information on related factors is available in EHCDs. However, we did work on improving an existing algorithm which aims to examine whole electronic hospital databases and identify children who do not have a CA, children who do have a CA and a small group of children whose records need to be examined by a clinician to determine if they have a CA. We provide the complete details of this algorithm to improve the use of hospital databases in the analysis of children with specific anomalies.

PART 1 Accuracy of congenital anomaly coding on live birth children recorded in health care databases

1 Background

Congenital anomaly (CA) registers are set up with the specific aim of monitoring the occurrence of CAs, to evaluate health care policies and to identify possible risk factors for CAs. Therefore, CA registers collect very detailed data on children and pregnancies affected with CAs including live births, fetal deaths and termination of pregnancies for fetal anomalies. Electronic health care data are increasingly being used by researchers to investigate the epidemiology of CAs, rather than using information from CA registries.

However, because electronic health care databases, such as hospital administrative databases, are not designed for research or surveillance, the health care data within have often been found to be incomplete with respect to the coding of diagnoses such as CAs. (1). Recent studies in the USA and Australia estimated that over 90% of livebirths with a CA would be identified (2-4), but that the proportions identified with specific anomalies is much lower (5). Andrade *et al*. (6) found only 37% of pregnancies affected with anencephaly were recorded in administrative claims and birth certificate data. Frohnert *et al.* (7) found that 50% of children atrial septal defects and 22% of patent ductus arteriosus were identified in discharge data from a large urban medical center. A Canadian study reported slightly higher accuracy, but this was based on a restricted set of 16 CA groups and small study population (8). In addition, Metcalfe *et al.* (9) showed that inpatient data (from hospitalisations) are adequate for ascertaining most, but not all CAs, while other sources of administrative data, particularly data from outpatient physician visits, were not adequate. Also, diagnoses in the hospital databases may be less precise which will result in many anomalies being categorised as 'unspecified' or 'other' (10). A change from suspected diagnosis to confirmed diagnosis might not be reflected in the administrative data of the hospital and the inclusion of suspected or unconfirmed clinical diagnoses will over-estimate the prevalence of CAs.

Identifying which specific CAs can be accurately identified using only electronic health care databases will enable the surveillance of these anomalies to be performed worldwide, and not just in regions with CA registries. Similarly identifying anomalies that are poorly reported in electronic health care databases (either under or over-reported) may limit their routine use or at least raise awareness of their limited accuracy.

2 Aim

In this EUROlinkCAT study (Accuracy of health care databases) we evaluated the accuracy and the quality of the coding of CAs in hospital databases, including outpatient clinics, compared to EUROCAT data, which was assumed to be the gold standard. We estimated the overall and anomaly-specific

accuracy for identifying CAs in hospital databases among children up to the first year of age born between January 2010 and December 2014, and evaluated the proportion of cases reported with a CA in the hospital data but not registered in the EUROCAT registry. Based on the results of this study we give recommendations for the coding of CA and the use of hospital databases in the future.

3 Methods

3.1 Study protocol and analysis plan

Development of the study began in 2019 when the protocol was written. The final version of the protocol was uploaded to the EUROlinkCAT website in October 2019 (Appendix 1). In addition to the protocol an analysis plan was written, by designing standardised tables with aggregated data to be filled in by each participating registry. The final version of the tables (v22, July 9 2021) was used in the data analyses (Appendix 2).

3.2 Linkage

The protocol and analysis plan expanded on the work that was done in Work Package 4 (WP4) and made use of the linked datasets that were created in WP4 of the EUROlinkCAT project (11). The study population from WP4 included all live born children with a major CA recorded in the EUROCAT registry born between 1995 (or the first year of the EUROCAT registry if later) and 2014 and a reference population of all live born children without any CAs (i.e. not recorded as CA cases in the EUROCAT registry) born during the same time period and from the same population area covered by the registry. In WP4, Tuscany included a random 10% sample (matched on sex and year of birth) from the reference population due to local constraints in sharing large volumes of data. Live born children from the EUROCAT registries and the reference children were linked to the hospital discharge records. Zagreb performed manual linkage with hospital data and included 2-3 matched hospital controls (matched on date of birth and infant sex) per case linked. Data from the hospital databases were included from the first birth year for each registry up to the end of 2015.

3.3 Participating registries and hospital databases

In this study, eleven EUROCAT registries in eight countries participated: Emilia Romagna (Italy), Tuscany (Italy), Valencian Region (Spain), Finland, Wales (UK), Thames Valley (England, UK), Wessex (England, UK), East Midlands and South Yorkshire (England, UK), Zagreb (Croatia), Funen (Denmark) and Northern Netherlands. These registries linked their CA data to regional or national health care (hospital) databases (12). A description of the eight hospital databases can be found in Table A (Description of hospital databases); the three English registries and the two Italian registries linked to their national hospital admissions databases. Two hospital databases used International Classification of Diseases – Clinical Modification (ICD-9-CM) codes (Scheda di Dimissione Osepdaliera linked to

Tuscany and Emilia Romagna and Conjunto Mínimo Básico de Datos linked to Valencian Region), and six used ICD-10 codes. Two hospital databases included inpatient and outpatient data (Landspatientregistret linked to Funen and Terveydenhuollon hoitoilmoitusrekisteri linked to Finland) and six included only inpatient data.

3.4 Study population

Inclusion criteria for this study were all live birth children born between 2010-2014, recorded in the EUROCAT registries and linked to hospital data (EUROlinkCAT cases) and children identified in the hospital databases with any CA code, i.e. an ICD-9-CM code in the range 740-759 or an ICD10 code from the Q-chapter. We restricted the diagnosis in all databases to those made in the first year of life. We also restricted the study period to 2010-2014 because we wanted to evaluate the validity of hospital coding of CAs in a recent time period. Northern Netherlands included EUROlinkCAT cases from birth years 2013-2014 and hospital cases from the *full reference* population from these birth years (in contrast to WP4 where a sample of 20% was included). The Dutch hospital databases changed significantly over the study period and there was one year without data (2012). The Dutch hospital data from 2010-2011 were considered less valid and therefore not included in this study. The registry from Wales included all births from 1995-2014. The registers from England (Thames Valley, Wessex and East Midlands and South Yorkshire) were unable to provide data from a reference population.

3.5 Standardization

All EUROCAT registries code and classify their CA cases according to EUROCAT guidelines (Guidelines for data registration | EU RD Platform (europa.eu). Each registry provided a data dictionary of the variables available in their hospital databases which enabled Ulster University (UU) to catalogue and document the information in preparation for standardization. The WP2 team from UU created registry-specific standardization Stata scripts to ensure that the local variables from each registry and hospital database were standardised to a common data model (Appendix 3) based on the study protocol, i.e. had the same name, coding and definition. Finland and Wales generated their own script in SAS and R respectively, based on a template provided by UU. All outputs were checked for consistency by the team of UU. The Welsh output could not be checked due to issues concerning the release of small numbers. The team from St George's University of London (SGUL) created a central analysis script in Stata based on the analysis plan to enable the participating registries to run these scripts on their local standardised linked datasets to produce standardised tables for analysis.

We focused on 17 specific anomalies, selected according to one of the following characteristics (see Table B):

1) anomalies detectable at birth (spina bifida, cleft lip with or without cleft palate, cleft palate, gastroschisis, omphalocele, clubfoot);
2) anomalies with a high prenatal detection rate (hypoplastic left heart syndrome, unilateral renal agenesis, limb reduction defects)
3) anomalies diagnosed after discharge from the maternity unit (severe microcephaly, ventricular septal defect (VSD), Hirschsprung's disease)
4) anomalies that present in variable form between normal and abnormal (atrial septal defect (ASD), congenital hydronephrosis, hypospadias)
5) chromosomal anomalies (Down syndrome)
6) mild anomalies (polydactyly).

For the standardisation of the selected anomaly groups the ICD-9-CM or ICD-10 diagnosis codes reported in the hospital databases, were classified as exact, appropriate, minor or unspecified. An exact code was defined as the specific ICD code for the CA. An appropriate code includes the range of codes for the organ system to which the CA belongs, in addition to the specific ICD code for the CA. Minor codes are specific codes for minor anomalies (as defined and excluded by EUROCAT if the minor anomaly occurs as the only anomaly, see JRC-EUROCAT-Section-3.2-23-9-2020.pdf (europa.eu)), and unspecified codes are codes that code for 'CA not otherwise specified'.

For example, the exact appropriate, minor and unspecified codes for **spina bifida** are:

Exact code	ICD-10 ICD-9 (ICD9-CM)	Q05 741	Spina bifida
Appropriate code	ICD-10 ICD-9 (ICD9-CM)	Q00-Q07 740-742	Congenital malformations of the nervous system
Minor code	ICD-10 ICD-9 (ICD9-CM)	Q760 75610 (756.17)	Spina bifida occulta
Unspecified code	ICD-10 ICD-9 (ICD9-CM)	Q899 7599 (759.9)	Congenital malformation unspecified

Box1 Exact appropriate, minor and unspecified codes for spina bifida

In Table B the exact, appropriate, minor and unspecified codes are presented for the 17 anomalies included in the analyses.

3.5 Data transmission to the Central Results Repository (CRR) and to WP6

The tables and results (aggregated data) created by each registry using the syntax scripts provided by SGUL were submitted in Excel and Stata file formats, to UU via the secure project portal. UU then provided the aggregate results via the secure portal to UMCG who performed the overall analyses. For privacy reasons Northern Netherlands data were rounded to the nearest 0, 5 and 10's and Funen could only report on anomalies where the overall number of cases or the number of cases with an exact, appropriate, minor/unspecified or unrelated code was at least 5 or null.

3.6 Analysis

We first studied the linkage success by calculating the proportion of EUROlinkCAT cases that were linked to the hospital data and the proportion of linked EUROlinkCAT cases with a major CA code registered in the hospital data. To assess the validity of the hospital data, we compared the codes in the hospital database to codes recorded in the EUROlinkCAT data for the 17 specific CAs described in Table B by calculating sensitivity and positive predictive value (PPV) for each specific anomaly.

		EUROlinkCAT case	
		Yes	No
Hospital case	Yes	**A** Case both registered in EUROlinkCAT and hospital database with (same) CA code	**B** Hospital case with CA code, not registered in EUROlinkCAT, or with other code in EUROlinkCAT
	No	**C** EUROlinkCAT case, not registered in hospital database or registered with other code in hospital database	**D** Children not registered in EUROlinkCAT and not registered in hospital database or registered without CA code in hospital database

Box 2 Comparison of CA codes used in EUROlinkCAT and hospital databases

3.6.1 Sensitivity

"Exact Sensitivity" measures the proportion of children correctly identified in the hospital data as children with a specific CA out of the total of all children within EUROlinkCAT with the exact CA (EUROCAT anomaly coding is being considered as the gold standard; see Box 2: sensitivity= A/(A+C)). A high "exact sensitivity" means that most of the EUROlinkCAT cases are correctly identified in the hospital database as having the same CA. Low "exact sensitivity" means that few EUROlinkCAT cases are correctly identified in the hospital database as having the same CA.

"Appropriate sensitivity" was calculated as the proportion of EUROlinkCAT cases with an appropriate code in the hospital database and "minor/unspecified sensitivity" as the proportion of EUROlinkCAT cases with a minor or unspecified code in the hospital data.

"Total sensitivity" for a specific anomaly was calculated as the number of children with an exact, appropriate or minor/unspecified code for that anomaly in the hospital data divided by the number of EUROlinkCAT cases with the specified anomaly (again EUROCAT coding was considered the gold standard). Note that "total sensitivity" does not include children with an unrelated CA code (CA code not classified as exact, appropriate, minor or unspecified) registered in the hospital data.

A high sensitivity is expected for anomalies that require hospitalisation (for instance for surgery). Newborns with CAs that do not require hospitalisations are most likely captured less well in hospital databases and therefore low sensitivity is expected. These anomalies are ascertained by EUROCAT

registries through other data sources. For the sensitivity analyses of EUROlinkCAT only live born cases with isolated anomalies (i.e. not part of a chromosomal disorder or syndrome and no other unrelated anomalies present) were included. For Finland and Funen, we calculated sensitivity for in-and outpatient data combined, and for in- and outpatient separately.

3.6.2 Positive predictive value (PPV)

PPV is the proportion of children in hospital data correctly identified as having a CA among all children who were identified as having an anomaly in hospital data (see Box 2: PPV= A/(A+B)). In this study a high PPV means that most of the hospital cases with a CA code did have the anomaly (as judged by being identified in EUROlinkCAT as having the same CA). A low PPV means that 'many' of the cases with a CA code in the hospital data did not have a CA according to EUROlinkCAT (false positive). We calculated exact PPV, appropriate PV and unrelated PPV for each of the specific anomalies described in Table B for registries who included the full hospital population as a reference. An unrelated code for a specific CA is a major CA code registered in EUROlinkCAT but not within the same organ system. Exact PPV is the proportion of cases with a specific anomaly code in the hospital data who were identified in the EUROlinkCAT data with the same CA code. Appropriate PPV is the proportion of cases with a specific anomaly code in the hospital data who were identified in the EUROlinkCAT data with a CA code in the appropriate range, but not the same specific CA code. This applies in similarly for unrelated PPV. The total PPV was calculated as the sum of exact PPV, appropriate PPV and unrelated PPV and is therefore the proportion of hospital cases with a specific CA code who were identified in the EUROlinkCAT data as having any major CA. PPV is not calculated for Tuscany, Thames Valley, Wessex, East Midlands and South Yorkshire and Zagreb since they did not have access to hospital data for the full reference population.

4 Results

4.1 Linkage success

In Table C the results of the linkage to the hospital databases are presented for each registry. Eight registries linked more than 90% of their live born cases to hospital data (Tuscany, Emilia Romagna, Valencian Region, Finland, the three English registries and Funen). Northern Netherlands linked 86% of their live born cases to the hospital database. Zagreb linked 58% of all EUROCAT live births to hospital data, but they performed manual linkage. Wales linked only 73% of their cases due to including birth years from 1995 – 2014. The proportion of linked EUROCAT cases with a CA code recorded in the hospital data in the first year of life varied from 49% in Zagreb and 57% in Northern Netherlands to 91% in Emilia Romagna and 96% in Valencian Region.

4.2 Validity of the anomaly coding in the hospital database

4.2.1 Sensitivity

We first compared the diagnosis code recorded in the hospital database up to the first year of life, for EUROlinkCAT linked live births with 16 non-chromosomal isolated anomalies and Down syndrome. In figure 1 the results are presented by anomaly subgroup and registry.

For anomalies detectable at birth total (exact, appropriate or minor/unspecified code) sensitivity was high (Figure 1). Total sensitivity for *isolated spina bifida* varied between 60% for Tuscany and 100% for Thames Valley. In only a small proportion of the spina bifida cases an appropriate code or unspecified code was used in the hospital databases. Total and exact sensitivity was also high for *cleft lip with or without cleft palate,* from 82% in Zagreb to 100% in Northern Netherlands. A more detailed review of hospital coding, showed that separate codes were recorded for cleft lip and palate in 30-40% of cases in Tuscany, Emilia Romagna and Thames Valley. In the other registries the majority of the cleft lip with or without cleft palate cases only had the cleft lip or the cleft lip with cleft palate code recorded in the hospital data. For *cleft palate* total and exact sensitivity was somewhat lower. For 57% of the cases (n=4) from Zagreb no hospital CA code was found for isolated cleft palate cases, for Tuscany only in 9% of the cases no hospital CA code was found. In the vast majority of the hospital cases with an exact cleft palate code, only one code was recorded.
With respect to abdominal wall defects (*gastroschisis and omphalocele*), total sensitivity was high, but in Emilia Romagna and Tuscany only appropriate ICD-9 CM codes were used in the hospital data (75679 “Other CA of abdominal wall” or 75670 “Anomaly of abdominal wall, unspecified”). For *clubfoot* total sensitivity was low in Northern Netherlands, Zagreb and Wales, whereas total sensitivity was high in Tuscany, Emilia Romagna, Valencian Region, Finland and Denmark. Except for Finland and Denmark, appropriate and minor or unspecified codes in hospital data for clubfoot are frequently used.

For anomalies with a high prenatal detection rate, sensitivity was high for *hypoplastic left heart syndrome (HLHS*), 100% in Tuscany, Emilia Romagna, Valencian Region, Thames Valley and Wessex, but an exact code was not always used. HLHS cases were not identified in the hospital data from Zagreb and a few HLHS cases from Finland, Wales and EM&SY had no CA code in the hospital data. The total sensitivity for *unilateral renal agenesis* varied between 100% in Valencia to 41% in Wales and 46% in EM&SY. Total sensitivity for *limb reduction defects* was highest in Emilia Romagna, Valencian Region and Tuscany (above 85%), compared to approximately 30% in Wales and 50% in Northern Netherlands (minor or unspecified codes). Appropriate codes were used in 7-18% of the cases.

Isolated anomalies usually diagnosed after discharge from the maternity unit showed high exact sensitivity for *Hirschsprung's disease* (over 90% in all registries; Zagreb reported no cases with Hirschsprung's disease) but variable sensitivity for the other anomalies. For *isolated severe microcephaly*, total and exact sensitivity were high in Tuscany, Emilia Romagna and Valencian Region (exact sensitivity > 85%). Total and exact sensitivity were much lower in Wales (41% and 39% respectively). The same pattern can be observed for *VSD*, with high total and exact sensitivity for Tuscany (85%), Emilia Romagna (92%) and Valencian Region (98%) and lower sensitivity for Northern Netherlands (33%) Zagreb (55%) and Wales (51%).

Anomalies with a grey zone between a normal and abnormal finding showed in general lower total sensitivity. Exact sensitivity for isolated *ASD* varied between 90% in Valencian Region and 23% in Zagreb, appropriate sensitivity varied between 50% in Northern Netherlands (only appropriate codes reported in the hospital data) and 7% in Emilia Romagna. Total sensitivity for *isolated congenital hydronephrosis* varied between 40% in Wales and 87% in Valencian Region. For *hypospadias* total sensitivity was lowest in Zagreb (22%) and highest in Valencian Region (91%).

For Down syndrome (chromosomal anomaly) exact sensitivity was over 76% in all registries and highest in Zagreb, Valencian Region and Northern Netherlands (96%, 95% and 100%, respectively).

Isolated polydactyly (mild anomaly) showed higher total sensitivity for Emilia Romagna and Valencian Region, Thames Valley, East Midlands and South Yorkshire and Wessex ($\geq$ 80%).

In summary, Emilia Romagna, Tuscany and Valencian Region showed in general higher total sensitivity for the 17 selected anomalies than other registries, with appropriate codes more commonly being used in the hospital databases. Wales showed lower total sensitivity, but exact codes were frequently used in the hospital database and the lower sensitivity may have been due to the inclusion of births from 1995 rather than 2010 in all other registries. The smaller registries (Zagreb, Northern Netherlands and Funen) showed variable sensitivity and due to reporting restrictions, we could not report sensitivity for all anomalies.

The hospital databases of Finland and Funen included both in- and outpatient data. However, due to reporting restrictions Funen could not publish in- and outpatient data separately. When we calculated sensitivity for the Finnish in- and outpatient data separately, we found that the exact sensitivities for certain anomalies were much lower in inpatient data than in outpatient data. The highest proportion of Finnish EUROlinkCAT cases with an exact CA code only reported in outpatient

data were found for clubfoot, unilateral renal agenesis, limb reduction defects, severe microcephaly, VSD, ASD, congenital hydronephrosis, hypospadias and polydactyly (Appendix 4).

4.2.2 Positive predictive value (PPV)

PPV was calculated for six registries that had access to the full hospital database: Emilia Romagna, Valencian Region, Wales, Finland, Northern Netherlands and Funen. In figure 2 the results are presented per anomaly subgroup and per registry.

For the anomalies detectable at birth, exact PPV for *spina bifida* varied between 37% in Valencian Region to 88% in Finland. Almost one third of the spina bifida cases from the Valencian Region hospital data were not recorded in the EUROCAT database. The PPV for orofacial clefts was high in all registries. Most of the hospital cases with *cleft lip with or without cleft palate* were registered as the same in EUROlinkCAT (exact PPV 83% - 96%). For hospital *cleft palate* cases the exact PPV was lower, but the appropriate PPV indicate that these cleft palate cases are registered in EUROlinkCAT with a more specific code (for instance a code for cleft lip with cleft palate). Also, for abdominal wall defects, the PPV was in general high. The PPV for *gastroschisis* was higher than the PPV for *omphalocele*. In Emilia Romagna the hospital database always uses an appropriate code (rather than an exact code) to code abdominal wall defects, therefore no cases were identified with gastroschisis and omphalocele in the hospital database.

Total PPV for the anomalies with a high prenatal diagnosis rate was over 83% in all registries and for all three selected anomalies. For *HLHS*, the exact PPV was much lower in Valencian Region (46%), Wales (63%) and Finland (74%). Also, the exact PPV for *unilateral renal agenesis* was between 55% and 63% in Emilia Romagna, Valencian Region and Wales. For *limb reduction defects* exact PPV was lowest in Valencian Region.

Total PPV for anomalies diagnosed after discharge from the maternity unit was over 71% for all anomalies in all registries except for Northern Netherlands. Total PPV for *severe microcephaly* was over 71% in all registries, but exact PPV was much lower. This was probably due to the strict definition of severe microcephaly in EUROCAT. Total PPV for *VSD* was lowest for Northern Netherlands (54%) and Emilia Romagna (74%), but the exact PPV for VSD was similar to total PPV. Also, for *Hirschsprung's disease* the total PPV was over 83% in all registries, exact PPV was lowest in Emilia Romagna (66%).

It is noticeable that the total PPV for anomalies with a grey zone between a normal and abnormal finding was among the lowest compared to the other anomaly groups in all registries, except for Finland. The exact PPV for *ASD* varies between 12% and 41%. For *congenital hydronephrosis* the exact PPV varied between 27% and 65% and was highest with 98% in Finland. The exact PPV for *hypospadias* was between 82-85% for most registries and lowest in Northern Netherlands and Funen with 50% and 76% respectively.
Total and exact PPV for Down syndrome was over 93% in all registries, except in Northern Netherlands (60%). For *polydactyly*, a mild anomaly, total PPV was over 80% in all registries (except Northern Netherlands) and the majority were coded with the same code in the EUROCAT database.

In summary, total PPV was over 90% in all registries for CL+/- P and CP (except in N Netherland), gastroschisis (except in Emilia Romagna), HLHS and Down syndrome. However, the exact PPV was frequently much lower, indicating that the child was correctly identified as a child with a CA in the hospital database, but that the diagnosis code applied by registry staff after review of data from several sources was not exactly the same as in the hospital database. The lowest PPV was observed in all registries for ASD (except for Finland).

4.2.3 Validity of hospital data – sensitivity and PPV combined

For four registries that had access to hospital data of the full reference population and could report the actual numbers (Emilia Romagna, Valencian Region, Wales and Finland), we cross tabulated the exact sensitivity against the exact PPV for the 17 selected anomalies, to see which anomalies subgroups had a high sensitivity and a high PPV (≥ 80%) and which had a low sensitivity and low PPV (< 80%). In Table D, the results of these cross tabulations are presented for each of the registries. The results indicate that hospital data were less accurate (low sensitivity and low PPV) for unilateral renal agenesis (3/4 registries) and accurate (high sensitivity and high PPV) for cleft lip with or without cleft palate (all registries), hypospadias (3/4 registries) and Down syndrome (3/4 registries).

4.2.4 Use of unspecified codes in hospital database

Tuscany, Emilia Romagna, Valencian Region, Wales and Finland reported the use of unspecified codes as the only code in hospital data, for a very limited number of cases (3-21 cases per region). Unspecified codes were used for anomalies of the ear (1-6 cases), anomalies of face and neck (1-9 cases per region) and anomalies of the eye (1-6 cases per region). Cases with an unspecified anomaly code in the hospital data as the only code were mostly not recorded in EUROCAT registries.

5 Discussion

In this work package, we investigated the validity of CA coding in live born children in eight electronic hospital databases, by comparing the CA codes of 17 anomalies in the hospital database of linked EUROlinkCAT cases from 11 EUROCAT registries and reference children. The results of this study are discussed with reference to the questions we formulated in our protocol.

Do all live births in the EUROCAT registry have a CA code in the hospital database?

A high proportion of the live births in EUROCAT registries had a CA code recorded in an electronic hospital database. On average 87% of the EUROlinkCAT cases were identified and linked to the hospital database (99% in Funen DK- 58% in Zagreb, Croatia). These proportions were comparable to proportions reported in other studies (2,3). A CA code was registered in the hospital database in the first year of life in 68% of the EUROlinkCAT cases (96% in the Valencian Region – 49% in Zagreb). The proportion of EUROCAT cases that was linked to hospital data and had a CA code recorded in the hospital data was lower in Zagreb due to manual linkage and lower in Wales due to births from 1995-2014 being included. For Finland and Funen, where the hospital databases include both inpatient data and outpatient data, 99% of the live born EUROCAT children were linked and in 90% a CA code was recorded in the hospital data.

There may be several reasons why a EUROlinkCAT case did not have a CA code in the hospital database. If a hospital database included only inpatient data, a CA code was most likely missing in the inpatient data for newborns and infants with a CA that does not require admission or surgery in the first year of life, or if specialist care is given outside the data coverage area. Also, if a newborn with a CA was admitted to the hospital and the admission was not related to the CA or the CA was diagnosed after the first year of life, a CA code may not be recorded for this child in the hospital data. A newborn with a CA that dies shortly after birth may not be recorded in the hospital (discharge) database with a CA code, if the hospital database recorded only CA codes related to discharge. Finally, a medical coder may have assigned an incorrect code, for instance the code for acquired hydronephrosis (N13.0) instead of congenital hydronephrosis (Q62.0).

Using the EUROCAT data as a gold standard, how valid is the anomaly coding in the hospital database (codes within the same organ system)?

In most registries exact sensitivity was high ($\geq$80%) for cleft lip with or without cleft palate, Down syndrome and Hirschsprung's disease. Low exact sensitivity (<50%) was frequently observed for clubfoot and congenital hydronephrosis. In registries that could report on the full reference population, PPV was high ($\geq$80%) for gastroschisis and Down syndrome and low (<50%) for ASD.

The comparison between CA coding in hospital databases and the EUROlinkCAT cases highlighted differences between the hospital databases. In general, total sensitivity for the seventeen anomaly subgroups was highest in Emilia Romagna, Tuscany, Valencian Region and Finland. Emilia Romagna, Valencian Region and Finland use their regional or national hospital database as an important source for case ascertainment for the EUROCAT registry. This may be an explanation for the high sensitivity. In Emilia Romagna, Tuscany and Valencian Region appropriate codes were used for certain anomaly subgroups, such as clubfoot, abdominal wall defects and congenital hydronephrosis, in a high proportion of the cases in the hospital database. These hospital databases use the ICD-9-CM coding system, whereas the EUROCAT registries use ICD-10 codes. It is interesting to investigate which ICD-9-CM codes are used for these anomalies in the hospital databases. A recent study showed changes in hospital prevalence after the transition in coding from ICD-9-CM to ICD-10-CM (13). Wales showed in general lower total sensitivity, but total sensitivity and exact sensitivity were similar indicating that most EUROlinkCAT cases were registered with the exact code in the hospital database. The smaller registries (Zagreb, Northern Netherlands and Funen) showed variable sensitivity, and sensitivity for all anomalies could not be presented due to reporting restrictions.

Although total PPV was high for several anomalies, the exact PPV was frequently much lower. This is an indication that the child was correctly identified as a child with a CA in the hospital database, but the diagnosis code applied by EUROCAT registry staff, after reviewing medical records, was different from the CA code in the hospital database. The lowest PPV was observed for ASD. When an ASD code was recorded in a hospital database, the child most likely does not have a major ASD anomaly. As defined by EUROCAT an ASD *secundum* should only be registered when a flow across the defect is still present 6 months after birth [Detailed congenital anomaly coding guidelines] .

Combining sensitivity and PPV in the four registries that could report actual numbers on the full reference population, showed that hospital data are accurate in reporting and coding of cleft lip with or without cleft palate, hypospadias and Down syndrome, and not accurate in reporting and coding of unilateral renal agenesis. Results for individual registries and hospital databases differed. CAs that require hospitalisation and surgery in the first year are more likely to be well recorded in hospital (discharge) databases. Also, if a diagnosis is very clear (there is for instance no variant of the anomaly that could be considered as minor), the validity of the hospital coding improved.

The registries included in this study generated different results for sensitivity and PPV in the coding of CAs in hospital databases. The variation in results can be due to differences in organisation of

healthcare. For instance, newborns in Italy with certain CAs may be more likely to be admitted to hospital than newborns in Wales with similar CAs. Also, the organisation and purpose of the hospital database, including coding practices, affects the sensitivity and PPV. Valencian Region studied the validity of the hospital data in a recent study and found an overall PPV of 56% (14). In the Northern Netherlands the setup of the hospital database changed in the study period. The results of the Dutch hospital data showed large differences, and therefore we decided to only use the data from the most recent years. It is noticeable that while results differ between regions, the results for the registries that linked to the same hospital database, Thames Valley, Wessex and East Midlands and South Yorkshire to the Hospital Episode Statistics, Admitted Patient Care and Tuscany and Emilia Romagna to the Scheda di Dimissione Osepdaliera, are comparable.

What proportion of cases in the EUROCAT database have out-patient codes only in the hospital database (for each EUROlinkCAT subgroup)?

The hospital databases from Finland and Denmark included both in- and out-patient data. Since the Funen registry could not publish in- and out-patient data separately, only the Finnish data were informative on the added value of out-patient data. The Finnish data showed that outpatient data were important to capture anomalies that do not always require surgery in the first year of life or can be treated in outpatient settings, such as clubfoot, unilateral renal agenesis, limb reduction defects, severe microcephaly, VSD, ASD, congenital hydronephrosis, hypospadias and polydactyly (exact code recorded in outpatient data only: 40% for clubfoot- 67% for VSD).

What proportion of EUROCAT cases have unspecified codes only in the hospital database?

Unspecified codes were not frequently present as the only code in hospital data. If used, unspecified codes were most commonly used for anomalies of the ear, anomalies of face and neck and anomalies of the eye.

What proportion of children with major CA (i.e. are in EUROCAT) are classified as minor anomalies in the hospital database (according to the EUROCAT definition of minor) and are there national differences?

Codes for minor and unspecified anomalies were not frequently used in the hospital databases, except for the coding of clubfoot.

5.1 Strengths

This is the first study to investigate the validity of hospital coding of CA in several European hospital databases, using EUROCAT as a gold standard. EUROCAT registries are high quality multiple source registries, that register and code CA according to the EUROCAT guidelines and use the EUROCAT Data Management Software for data management for data validation, standardization and transmission to the Central Registry (15). We applied strict definitions on the definition of exact, appropriate and minor or unspecified codes and used these both on EUROlinkCAT and hospital data. Standardization and analysis scripts were written centrally and applied by the individual registries, ensuring robust analysis of the EUROlinkCAT and hospital databases.

5.2 Limitations

We could not analyse all CA subgroups but focused on a limited number of anomalies. The inclusion of EUROlinkCAT cases diagnosed after the first year, may give fewer positive results. Reporting restrictions for small numbers in the Netherlands and Denmark limited the interpretation of the results of these registries. Although one of the aims was to investigate what proportion of EUROCAT cases were registered in outpatient data only, there was only one registry that could analyse and report the hospital data for in- and outpatient data separately. Several of the EUROCAT registries used the hospital database as a source of case ascertainment. For these registries the hospital database was not an independent data source and sensitivity and PPV may be biased upwards. For instance, in Finland the hospital database was an important source for the CA registry in the case ascertainment. The sensitivity and PPV are therefore high for all anomalies included in this study. It was not possible to calculate PPV and over/under reporting for registries with no data on the whole reference population.

6 Conclusions and recommendations

In conclusion, we found that there was variable accuracy of CA coding in hospital databases. Accuracy depends on type of anomaly, organisation of the healthcare system and the setup of the hospital databases. Hospital databases were in general accurate in the registration and coding of cleft lip with or without cleft palate, hypospadias and Down syndrome, but not accurate in registration and coding of unilateral renal agenesis, severe microcephaly and ASD. However, the accuracy differed by hospital database.

When electronic hospital databases are used to monitor the prevalence of CAs, there are the certain pitfalls to take into account. In the first place, not all births with CAs are registered in hospital databases. Pregnancies that result in termination because of a prenatal diagnosis for fetal anomalies

are often missing in hospital discharge databases. This is in particular relevant for anomalies with a high termination rate, such as spina bifida, certain heart anomalies and chromosomal anomalies. Secondly, CAs that do not require hospitalisation or surgery are often underreported in hospital discharge databases. Thirdly, hospital databases often do not include information on related factors, such as gestational age at birth, which can differentiate between anomalies at term vs normal aspects of development in preterm births. And finally, coding and identification of children with complex and multiple anomalies may be challenging, which is important to consider when evaluating the aetiology and outcomes in children with CAs. Therefore, CA registries where experts validate and code the CA based on all available information are still the most appropriate data source to monitor the prevalence of CAs, evaluate health care policies and study possible risk factors.

In the absence of a CA register, hospital data may be used to monitor certain CAs, but not all anomalies are captured well in hospital databases. For these anomalies additional data sources should be used. When using an electronic hospital database, it is important to have a firm knowledge of coding practices in hospital databases and to be informed regarding the specific codes that are used for specific anomalies. These may not always be the correct code according to the EUROCAT guidelines. If available, outpatient data should be used to improve accuracy. Also, it is important to be aware of the specific CAs that are not recorded accurately in the hospital database (for instance CAs with a high termination rate, or mild anomalies that do not require hospitalisation).

To optimise the use of electronic hospital databases and obtain the maximum amount of accurate information from these electronic health care databases, the application of an algorithm using a set of codes (for instance including procedures, multiple sources) is recommended. In regions where a CA registry exists, hospital data could be an additional source for active searching of CA cases, not otherwise reported by the CA registry (16, 17). Also, the development of such an algorithm may be useful for CA registers in order to ensure that cases/clinical diagnoses identified do not include differential or unconfirmed diagnoses (18).

7 Dissemination / Publication plans

The results of this study will be published in an open access scientific journal and used in Deliverable 8.3: Report to EU institutions hosting health care databases with guidelines for improving the quality of the CA coding. The results will be also presented at the final EUROlinkCAT conference.
The protocol and tables will be made available to registries who want to investigate the accuracy of administrative health care databases in the reporting of CAs.

8 Potential Impact

The results of this study are expected to have multiple impacts. First, this study shows that, whilst some anomalies are reported with a high accuracy in hospital databases, anomalies that are diagnosed after discharge from the maternity unit, are mild or have a variable form between normal and abnormal presentation, are reported with lower accuracy. Therefore, reserachers that use hospital databases as a primary source to study the epidemiology of CAs, will be more aware of the limitations of hospital data. Second, these results can be used by CA registries in discussion with funding bodies or local authorities to convince them of the importance of a high quality CA registry. The tables and analyses scripts will be made available to CA registries that want to investigate the accuracy of their local electronic hospital database. And third, the use of an algorithm as described in Part 2 of this report will help researchers to optimise the use of electronic hospital databases. We will investigate in more detail factors that affect accuracy of CA coding and the level of under- or overreporting in hospital databases. The results will be published in an open access scientific journal and made available to all researchers and relevant authorities

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Part 1 Tables and Figures

Table A Description of hospital databases

Eurocat Registry	Hospital database	Coverage	Hospital data		ICD coding in hospital data	Diagnosis in relation to	Used for data ascertainment by registry	Validation of diagnosis if used as source of ascertainment
			In-patient	Out-patient				
Funen	Landspatientregistret	National	X	X	ICD-10	Discharge	Yes	Yes
Tuscany	Scheda di Dimissione Osepdaliera	National / regional data control	X	-	ICD-9-CM	Discharge	No	
Emilia Romagna							Yes	Yes
Netherlands	Landelijke basisregistratie ziekenhuiszorg (LBZ)	National	X	-	ICD-10	Discharge and treatment	No	
Zagreb	BIS- BOLNIČKI INFORMACIJSKI SUSTAV	Hospital	X	-	ICD-10	Discharge	Yes	Yes
Finland	Terveydenhuollon hoitoilmoitusrekisteri	National	X	X	ICD-10	Discharge	Yes	Yes
Wales	Patient Episode Database for Wales (PEDW) (Inpatient data)	National	X	-	ICD-10	Discharge	Yes	Yes
Thames Valley	Hospital Episode Statistics, Admitted Patient Care	National (England)	X	-	ICD-10	Discharge	No	
Wessex								
East Midlands & South Yorkshire								
Valencian region	Conjunto Mínimo Básico de Datos (CMBD)	National but access to regional data	X	-	ICD-9-CM	Discharge	Yes	Yes

Table B Definition of exact, appropriate, minor and unspecified codes for the seventeen anomalies included in this study.

	Exact		Appropriate *		Minor		Unspecified	
	ICD9 (ICD9 CM)	ICD10	ICD-9 (ICD-9-CM)	ICD-10	ICD-9 (ICD-9-CM)	ICD-10	ICD-9 (ICD-9-CM	ICD-10
Detectable at birth								
- Spina bifida	741	Q05	740-742	Q00-Q07	75610 (756.17)	Q760	7599 (759.9)	Q899
- Cleft lip +/-cleft palate	7491, 75492 (749.1 , 749.2)	Q36, Q37	749	Q35-Q37	-	-	7599 (759.9)	Q899
- Cleft palate	7490 (749.0)	Q35	749, excluding 74908 + (749.02)	Q35-Q37, excluding Q357	74908, (749.02), 75024**	Q357	7599 (759.9)	Q899
- Gastroschisis	75671 (756.73)	Q793	7567 (756.7)	Q79			7599 (759.9)	Q899
- Omphalocele	75670 (756.72)	Q792	7567 (756.7)	Q79			7599 (759.9)	Q899
- Clubfoot	75450 (754.51)	Q660	754-755, excluding 75451,75452, 75453,75460, 75461,75469, 75470,75471 (754.50, 754.52, 754.53,754.59, 754.60, 754.61, 754.62, 754.69, 754.71, 754.79)	Q65-Q74, excluding Q661-Q669	75451,75452, 75453,75460, 75461,75469, 75470,75471 (754.50, 754.52, 754.53,754.59, 754.60, 754.61, 754.62, 754.69, 754.71, 754.79)	Q661-Q669	7599 (759.9)	Q899
High prenatal detection rate								
- Hypoplastic left heart syndrome	7467 (746.7)	Q234	745-747	Q20-Q28			7599 (759.9)	Q899
- Unilateral renal agenesis	753011* (753.0)	Q600	753	Q60-Q64			7599 (759.9)	Q899
- Limb reduction defects	7552-7553 (755.2-755.3)	Q71-Q73	754-755, excluding 75451,75452, 75453,75460, 75461,75469, 75470,75471 (754.50, 754.52, 754.53,754.59,	Q65-Q74, excluding Q661-Q669			7599 (759.9)	Q899

			754.60, 754.61, 754.62, 754.69, 754.71, 754.79)					
Diagnosed after discharge from maternity unit							7599 (759.9)	Q899
- Severe microcephaly	7421 (742.1)	Q02	740-742	Q00-Q07			7599 (759.9)	Q899
- Ventricular Septum Defects	7454 (745.4)	Q210	745-747	Q20-Q28			7599 (759.9)	Q899
- Hirschsprung's disease	75130-75133 (751.3)	Q431	751	Q41-Q43			7599 (759.9)	Q899
Grey zone between normal and abnormal							7599 (759.9)	Q899
- Atrial Septum Defects	7455 (745.5)	Q211	745-747	Q20-Q28			7599 (759.9)	Q899
- Hydronephrosis	75320 (753.20)	Q620	753	Q62-Q64			7599 (759.9)	Q899
- Hypospadias	75260 (752.61)	Q54	752	Q54-Q56			7599 (759.9)	Q899
Chromosomal anomaly								
- Down syndrome	7580 (758.0)	Q90	758	Q90-Q93, Q96-Q99			7599 (759.9)	Q899
Mild anomaly								
- Polydactyly	7550 (755.0)	Q69	754-755, excluding 75451,75452, 75453,75460, 75461,75469, 75470,75471 (754.50, 754.52, 754.53,754.59, 754.60, 754.61, 754.62, 754.69, 754.71, 754.79)	Q65-Q74, excluding Q661-Q669			7599 (759.9)	Q899

* appropriate codes are defied such that they exclude minor/unspecified codes

** no ICD9-CM code

Table C Result of linkage of EUROCAT registries to hospital databases

Number and % of EUROCAT livebirth cases linked to hospital data and number and % of linked EUROCAT livebirth cases with congenital anomaly code in hospital data.

Registry or region	1) All EUROCAT Livebirths	2) Linked to hospital data		3) Linked cases: Congenital anomaly code in hospital data	
		n	%	n	%
Tuscany, Italy	2,481	2260	91.1%	1,849	81.8%
Emilia Romagna, Italy	4,413	4,047	91.7%	3,663	90.5%
Valencian Region, Spain	4,308	4,210	97.7%	4,044	96.1%
Finland	12,772	12,673	99.2%	11,388	89.9%
Wales, UK	17,582	12,856	73.1%	8,832	68.7%
Thames Valley, UK	2,120	2,000	94.3%	1,560	78.1%
Wessex, UK	2,090	1,930	92.4%	1,575	81.7%
East Midlands & South Yorkshire, UK	3,405	3,290	96.6%	2,590	78.8%
Zagreb, Croatia	585	337	57.6%	164	48.7%
Northern Netherlands	585	505	86.3%	290	57.4%
Funen, Denmark	505	500	99.0%	450	90.0%
Total	50,845	44,107	86.7%	30,081	68.2%

[1] Births from 1995-2014

Table D Validity of hospital data in the registration and coding of congenital anomalies, by comparing exact sensitivity and exact Positive predictive value (PPV), by registry

	Low Exact PPV (< 80%)	High Exact PPV (>= 80%)
Low Exact SE (< 80%)	Hospital data are not very accurate, additional data sources are needed for validation and ascertainment	Most CA cases in hospital data are registered as EUROlinkCAT cases with same CA code, but other data sources than hospital data are needed to ascertain all cases
High Exact SE (>=80%)	Most EUROlinkCAT cases are also registered with same CA code in the hospital database, but there are also non-valid CA registrations in hospital.	Hospital data are very accurate

Emilia Romagna

	Low Exact PPV (< 80%)	High Exact PPV (>= 80%)
Low Exact SE (< 80%)	Cleft palate Unilateral renal agenesis, **Congenital hydronephrosis**	Clubfoot
High Exact SE (>=80%)	Spina bifida, Severe microcephaly, Ventricular septum defect, Hirschsprung's disease, **Atrial septum defect**, Polydactyly	**Cleft lip with or without cleft palate**, Hypoplastic left heart syndrome Limb reduction defects, **Hypospadias,** **Down syndrome**

Valencian Region

	Low Exact PPV (< 80%)	High Exact PPV (>= 80%)
Low Exact SE (< 80%)	Spina bifida, Cleft palate, Omphalocele, Hypoplastic left heart syndrome, **Congenital hydronephrosis**, Polydactyly	Gastroschisis, Clubfoot
High Exact SE (>=80%)	Unilateral renal agenesis, Limb reduction defects, Severe microcephaly, Hirschsprung's disease, **Atrial septum defect**	**Cleft lip with or without cleft palate**, Ventricular septum defect, **Hypospadias,** **Down syndrome**

Finland

	Low Exact PPV (< 80%)	High Exact PPV (>= 80%)
Low Exact SE (< 80%)	Severe microcephaly	Unilateral renal agenesis, Limb reduction defects, Polydactyly
High Exact SE (>=80%)	Hypoplastic left heart syndrome **Atrial septum defect**	Spina bifida, **Cleft lip with or without cleft palate**, Cleft palate, Gastroschisis, Omphalocele, Clubfoot, Ventricular septum defect, Hirschsprung's disease, Congenital hydronephrosis, **Hypospadias,** **Down syndrome**

Wales (Note births from 1995-2014)

	Low Exact PPV (< 80%)	High Exact PPV (>= 80%)
Low Exact SE (< 80%)	Club foot, Unilateral renal agenesis, Limb reduction defects, severe microcephaly, Atrial septum defect, **Congenital hydronephrosis**	Ventricular septum defect, Hypospadias, Down syndrome, Polydactyly
High Exact SE (>=80%)	Spina bifida, Omphalocele, Hypoplastic left heart syndrome,	**Cleft lip with or without cleft palate**, Cleft palate, Gastroschisis, Hirschsprung's disease

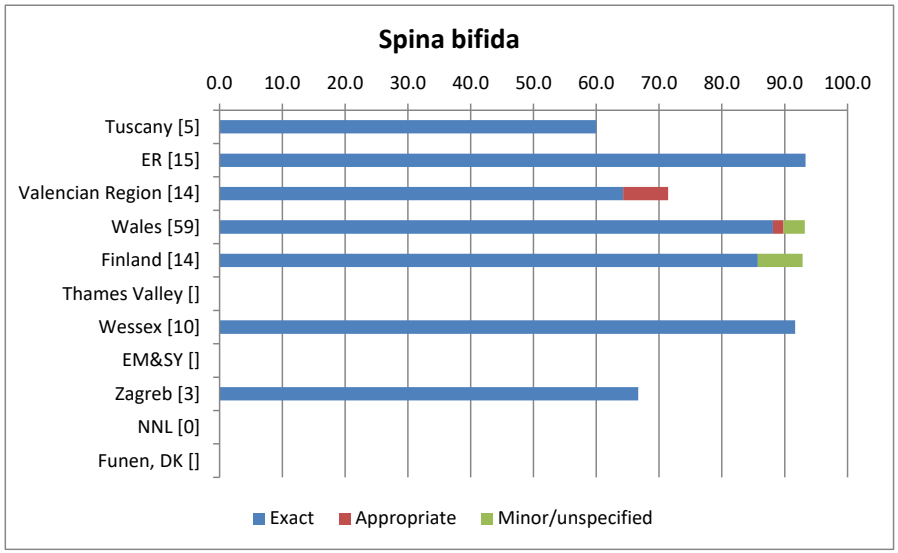
Figures 1 Sensitivity (%) per anomaly subgroup (isolated anomalies) and per registry

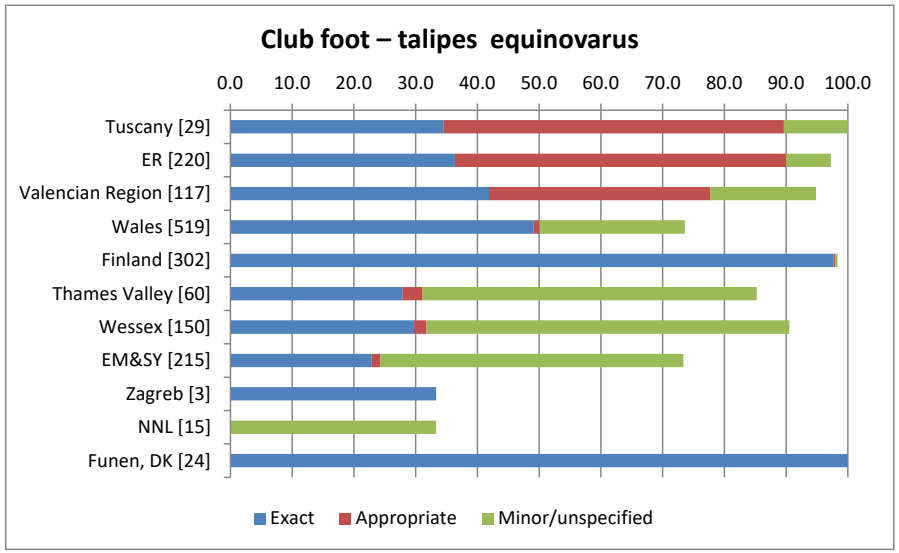
Numbers between brackets are numbers of cases. Numbers have been rounded to 0 or 5 for Thames Valley, Wessex, EM&SY and NNL

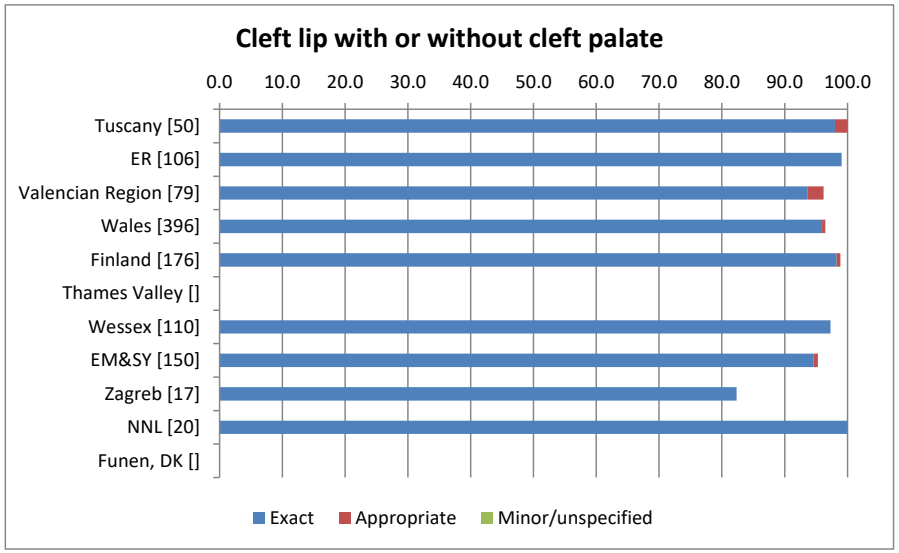
When potential disclosure issues arise, data are set to missing for Thames Valley, Wessex and EM&SY

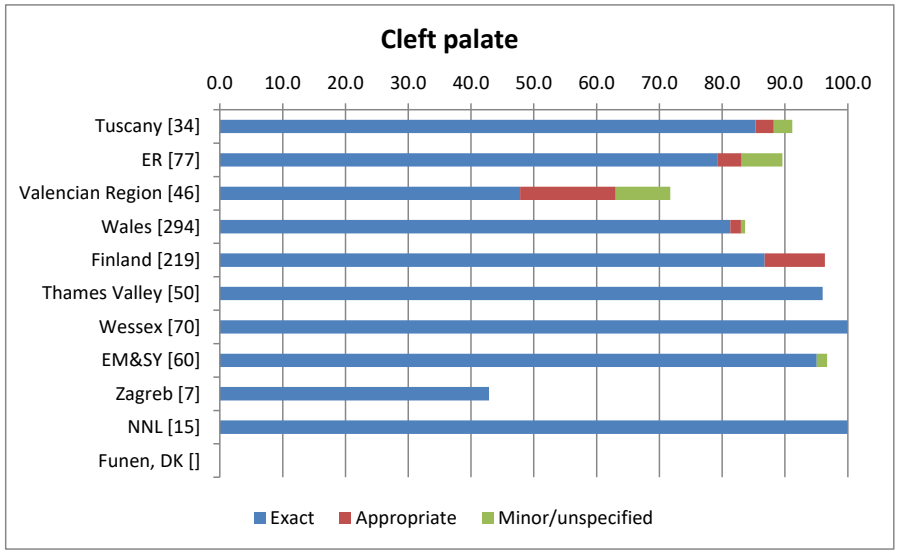
Sensitivity is reported as percentage.

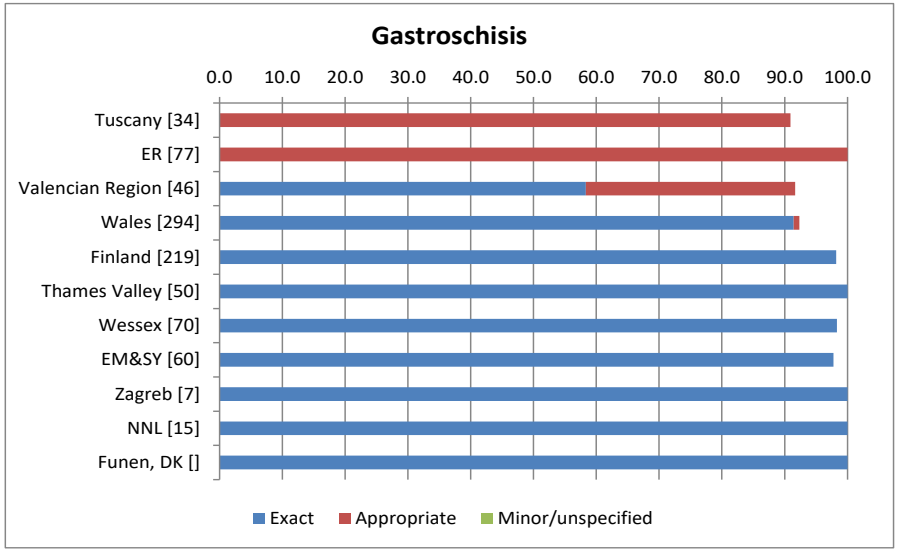
I Anomalies detectable at birth

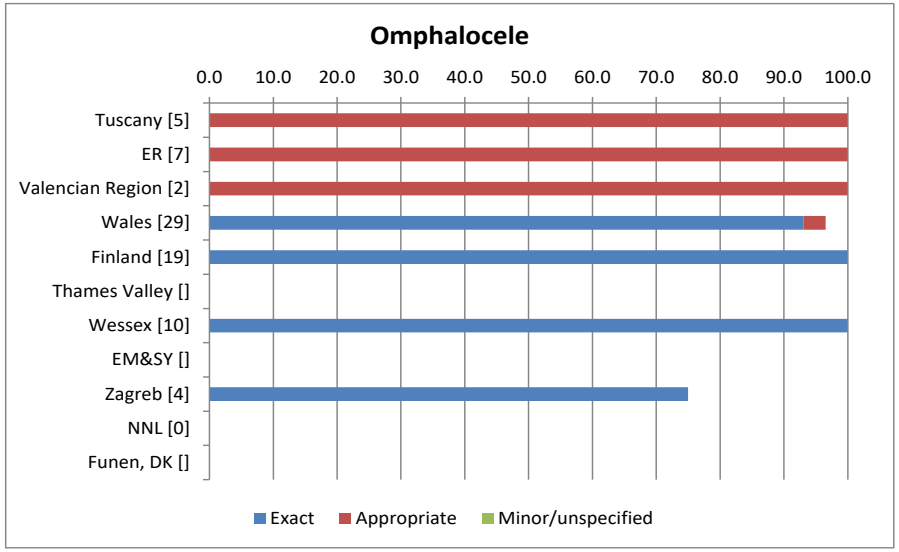




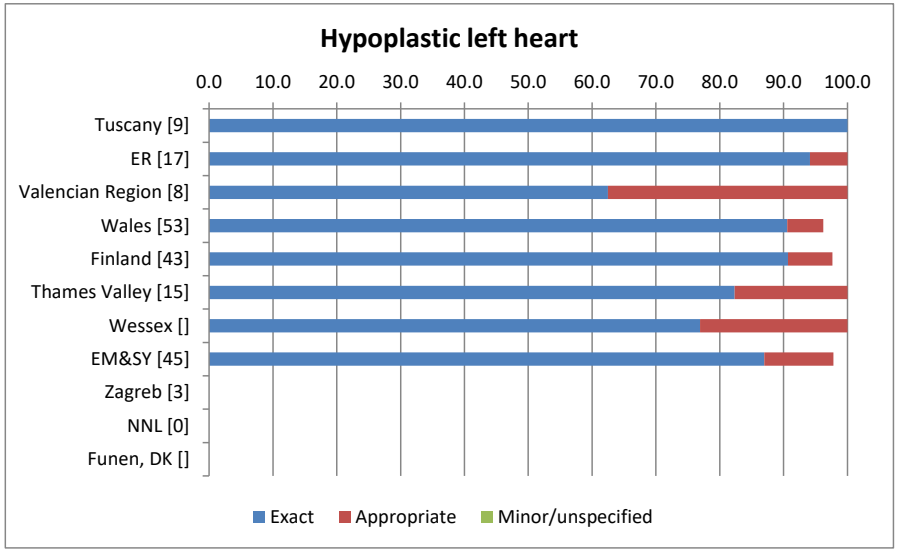

Cleft lip with or without cleft palate
0.0 10.0 20.0 30.0 40.0 50.0 60.0 70.0 80.0 90.0 100.0
Tuscany [50]
ER [106]
Valencian Region [79]
Wales [396]
Finland [176]
Thames Valley []
Wessex [110]
EM&SY [150]
Zagreb [17]
NNL [20]
Funen, DK []
Exact
Appropriate
Minor/unspecified

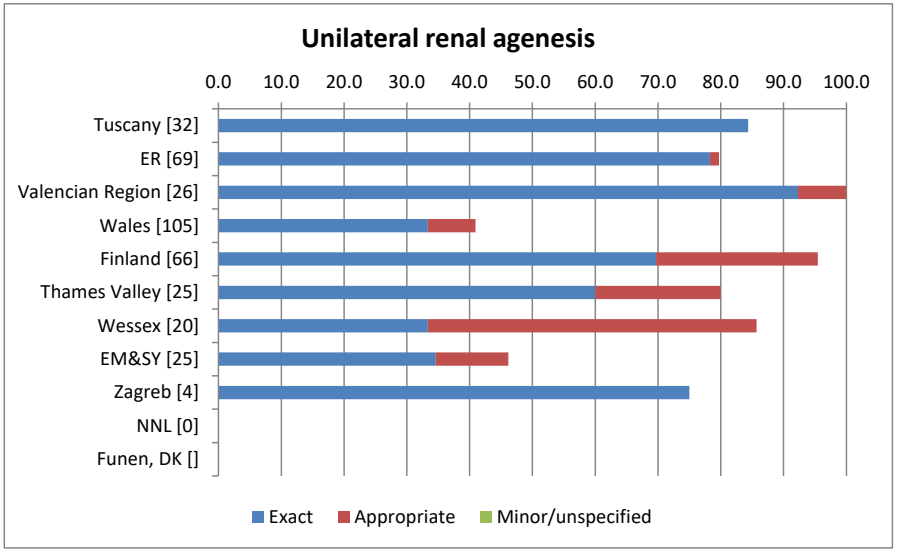

Cleft palate
0.0 10.0 20.0 30.0 40.0 50.0 60.0 70.0 80.0 90.0 100.0
Tuscany [34]
ER [77]
Valencian Region [46]
Wales [294]
Finland [219]
Thames Valley [50]
Wessex [70]
EM&SY [60]
Zagreb [7]
NNL [15]
Funen, DK []
Exact
Appropriate
Minor/unspecified

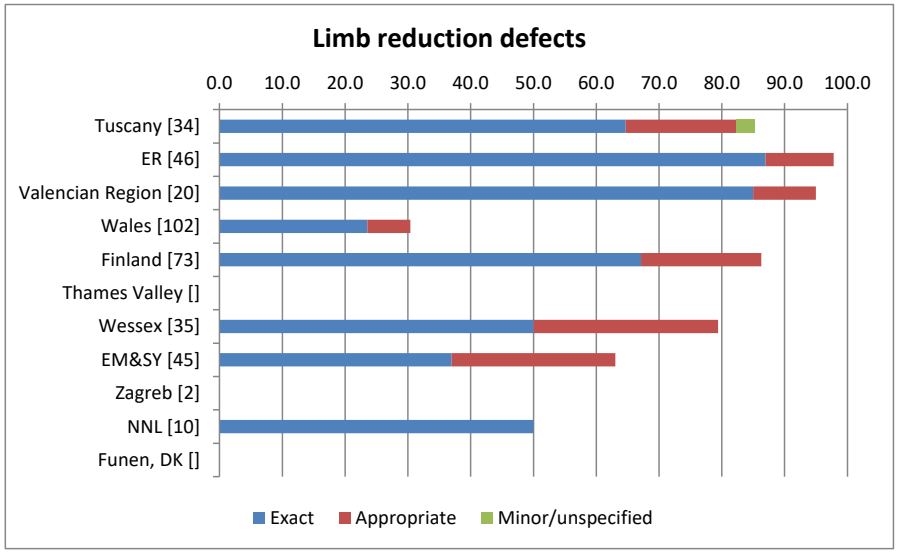

Gastroschisis
0.0 10.0 20.0 30.0 40.0 50.0 60.0 70.0 80.0 90.0 100.0
Tuscany [34]
ER [77]
Valencian Region [46]
Wales [294]
Finland [219]
Thames Valley [50]
Wessex [70]
EM&SY [60]
Zagreb [7]
NNL [15]
Funen, DK []
Exact
Appropriate
Minor/unspecified


Omphalocele
0.0 10.0 20.0 30.0 40.0 50.0 60.0 70.0 80.0 90.0 100.0
Tuscany [5]
ER [7]
Valencian Region [2]
Wales [29]
Finland [19]
Thames Valley []
Wessex [10]
EM&SY []
Zagreb [4]
NNL [0]
Funen, DK []
Exact
Appropriate
Minor/unspecified

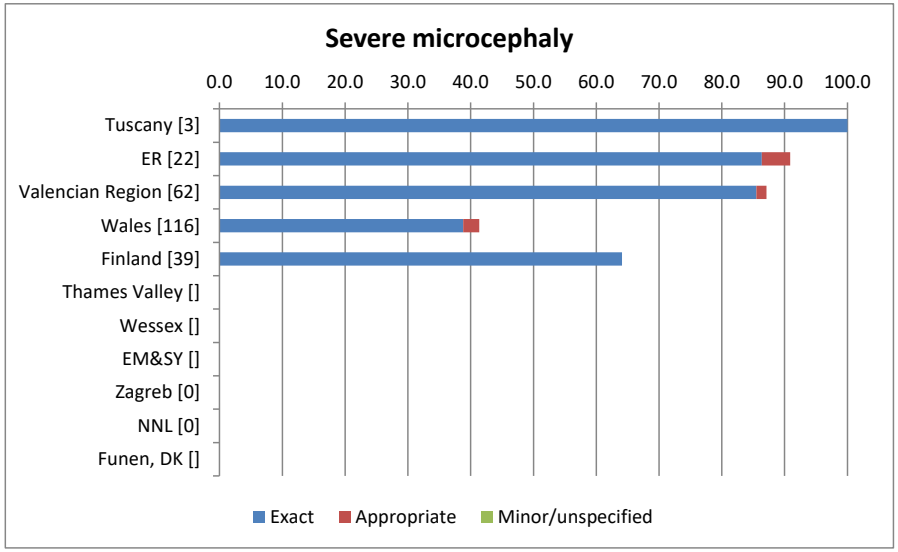
II Anomalies with high prenatal detection rate

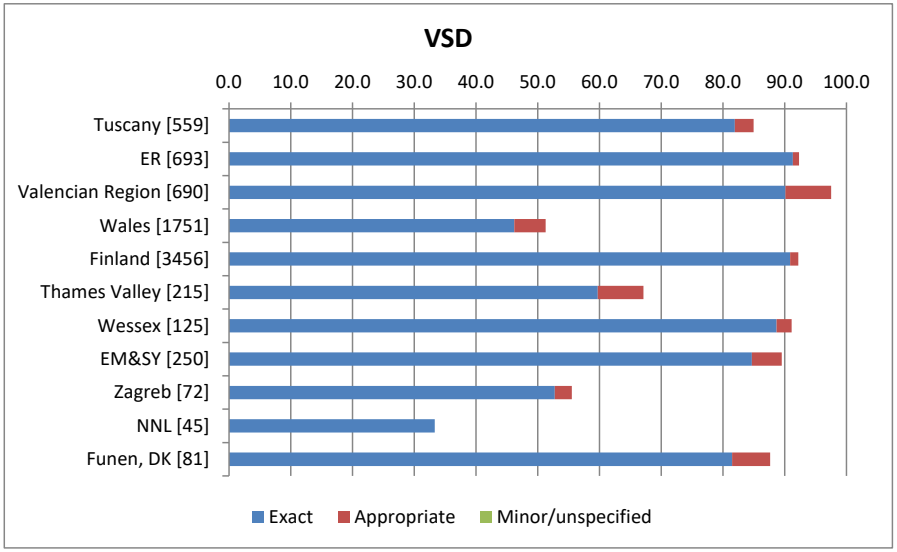


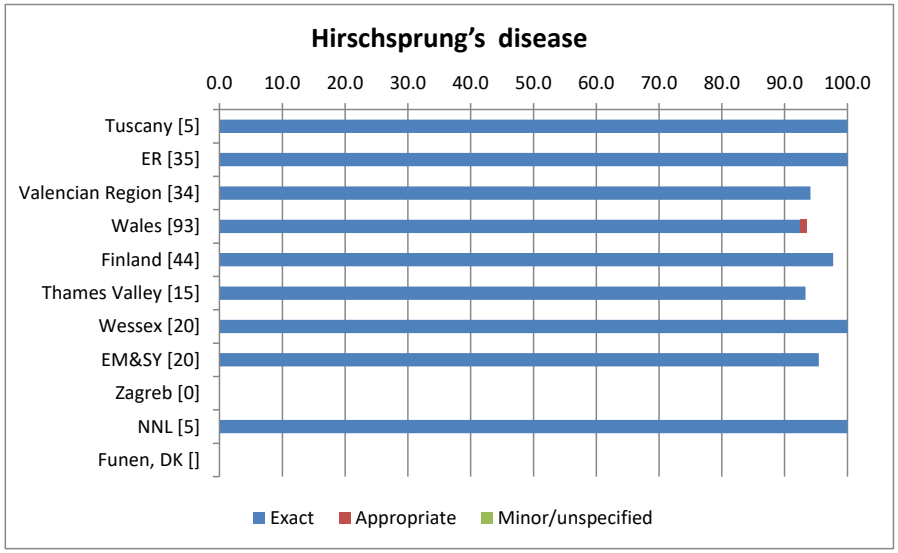




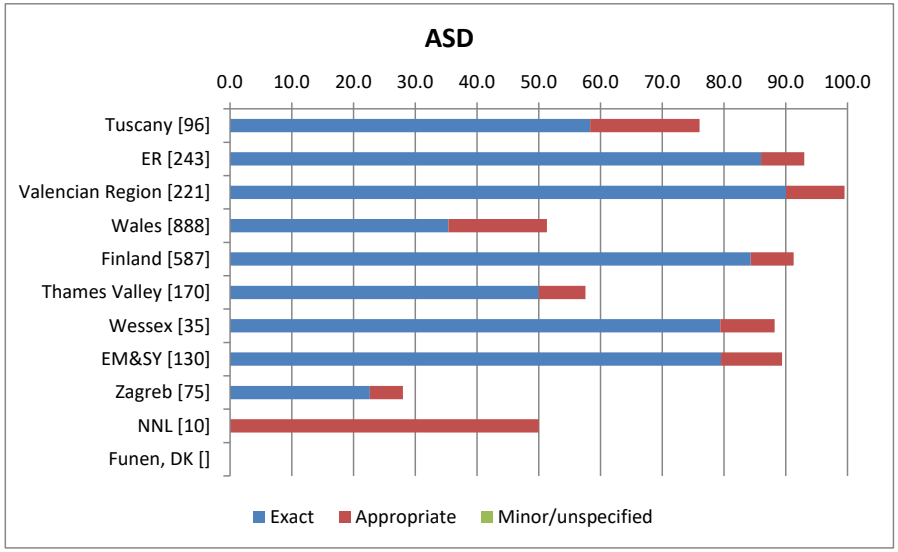
III Anomalies with late diagnosis

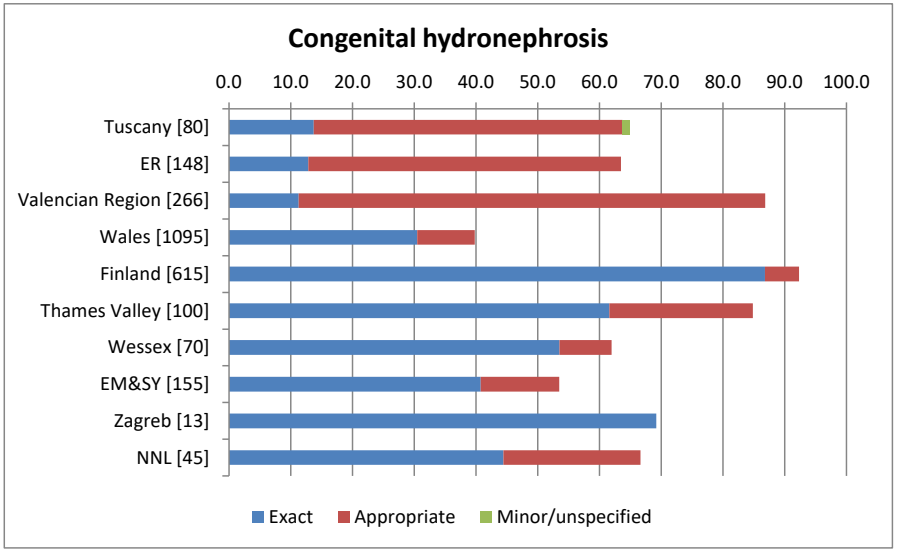


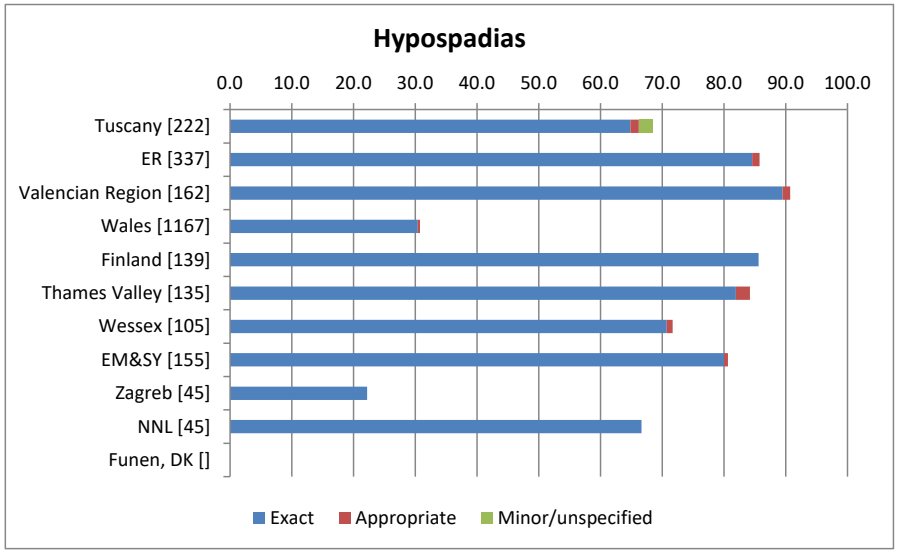




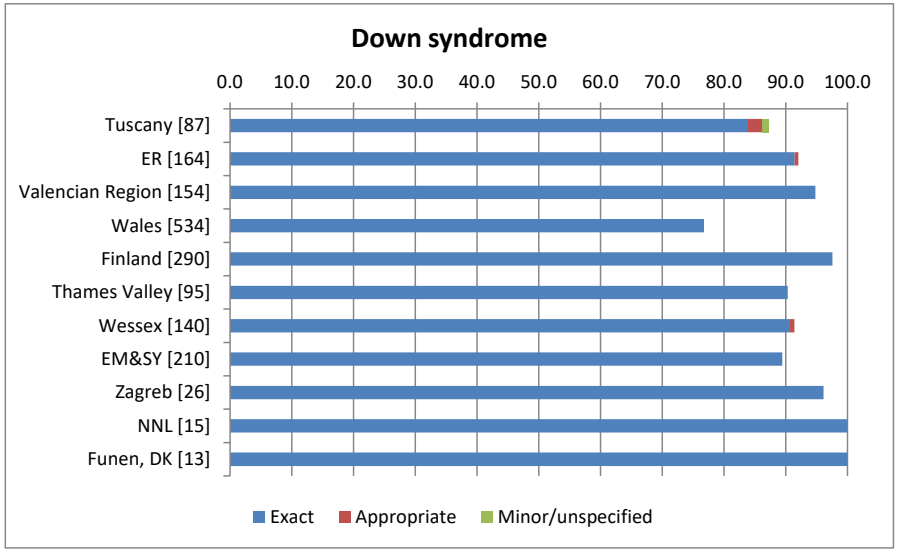
IV Anomalies with grey zone between a normal and abnormal finding







IV Chromosomal and mild anomaly



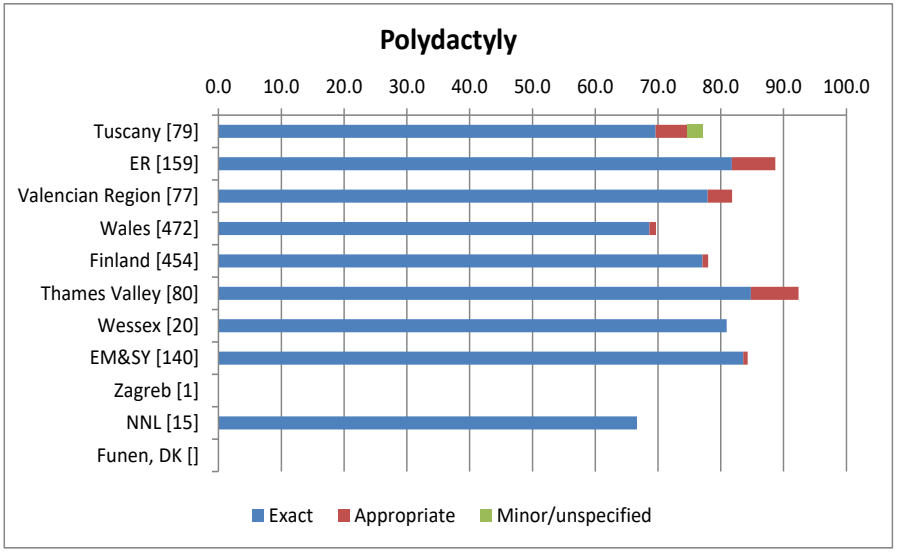
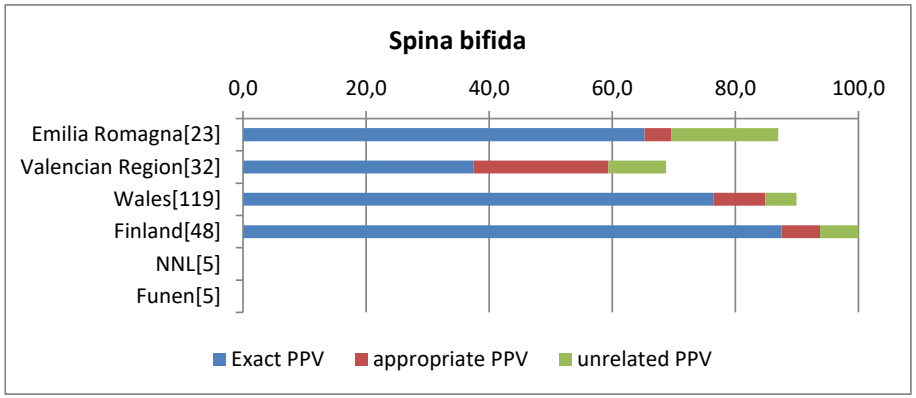
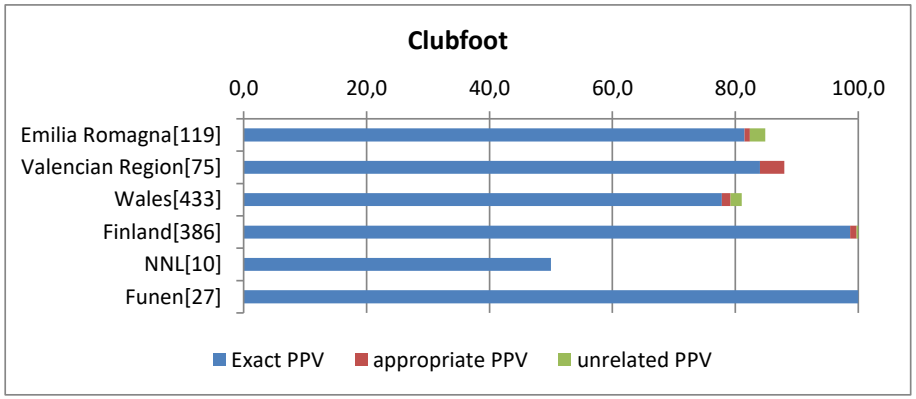


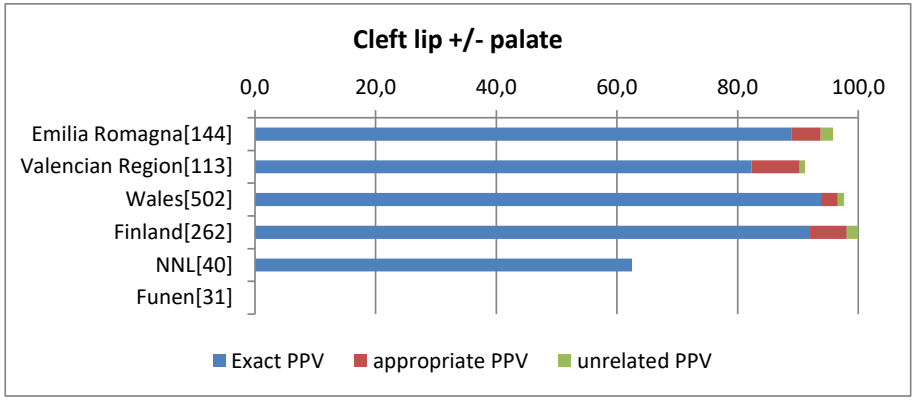
Figure 2 Positive predictive value (%) per anomaly subgroup and per registry

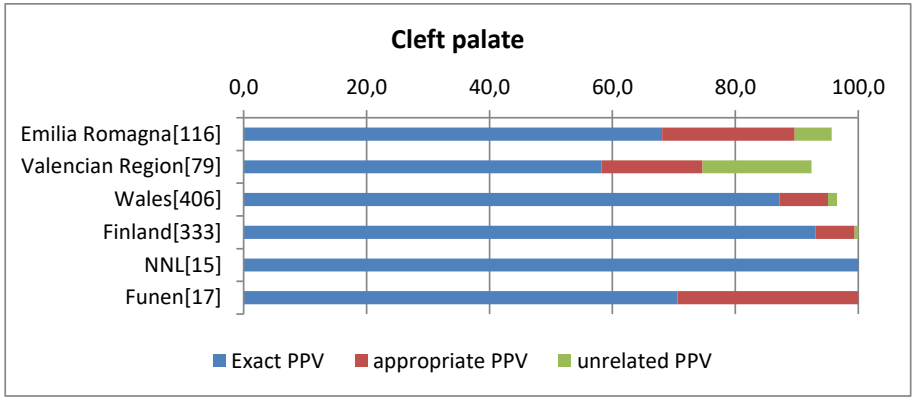
Number between brackets are number of cases. PPV is reported as percentage.

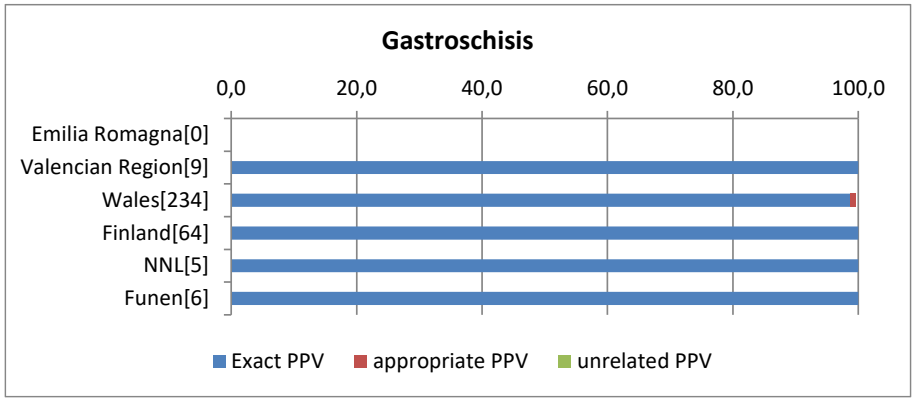
I Anomalies detectable at birth

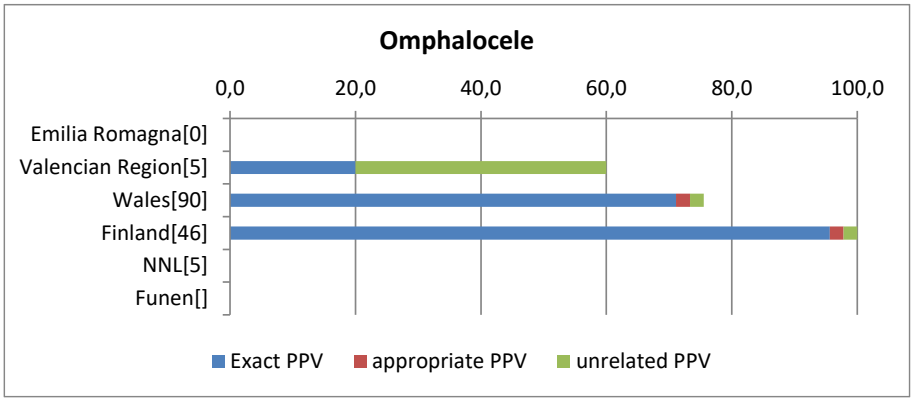




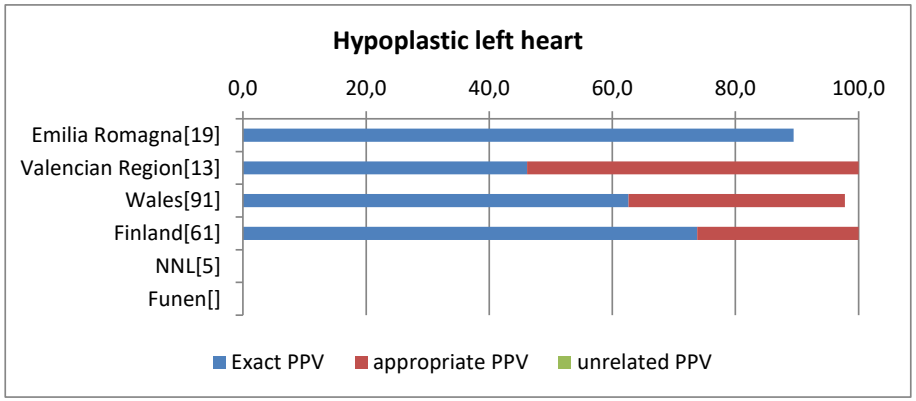


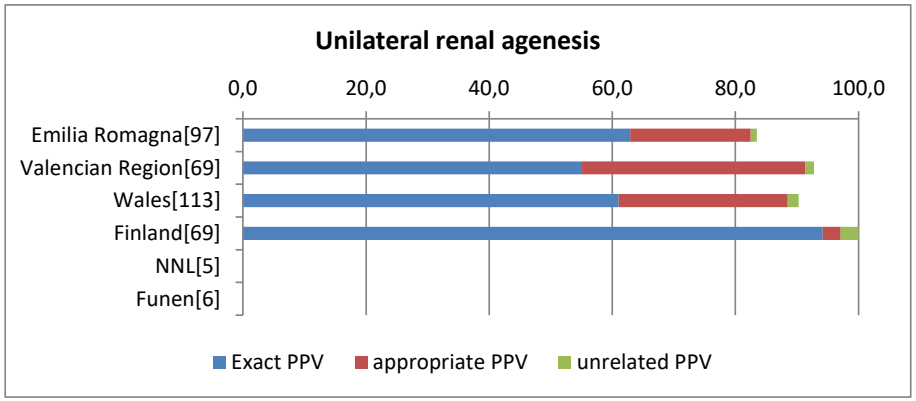


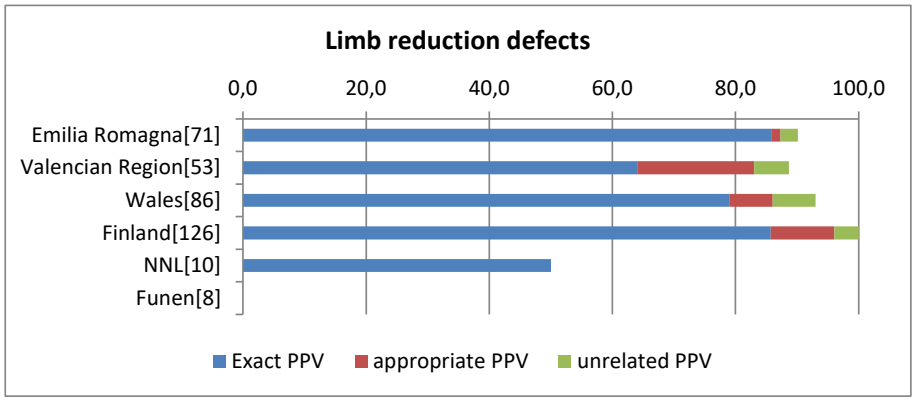




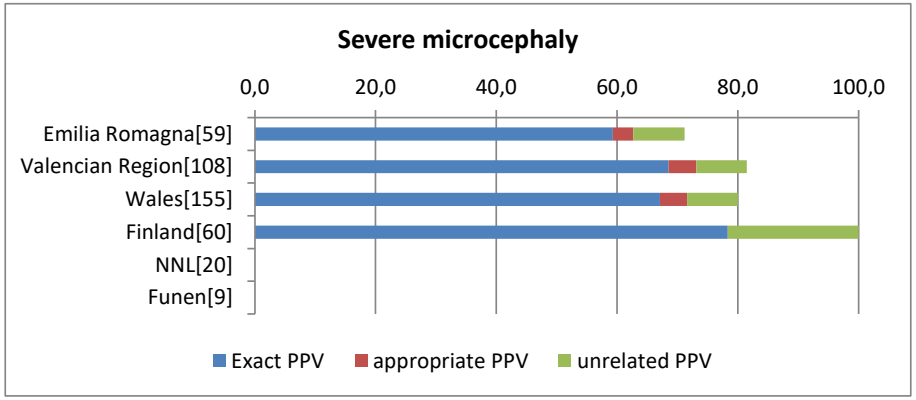
II Anomalies with high prenatal detection rate

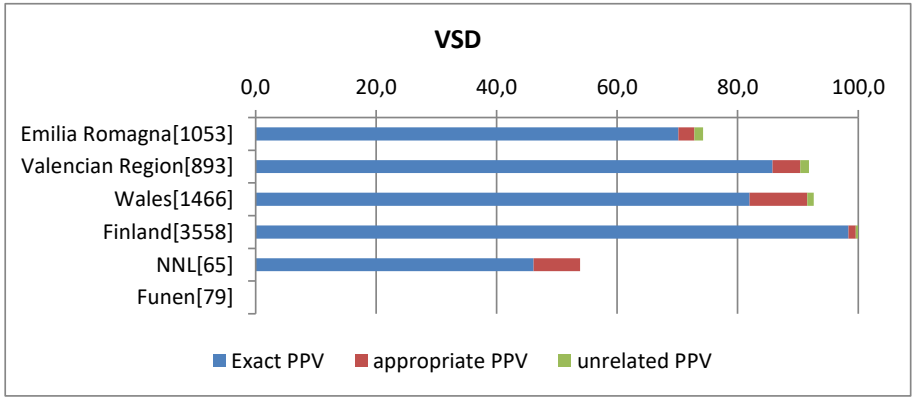


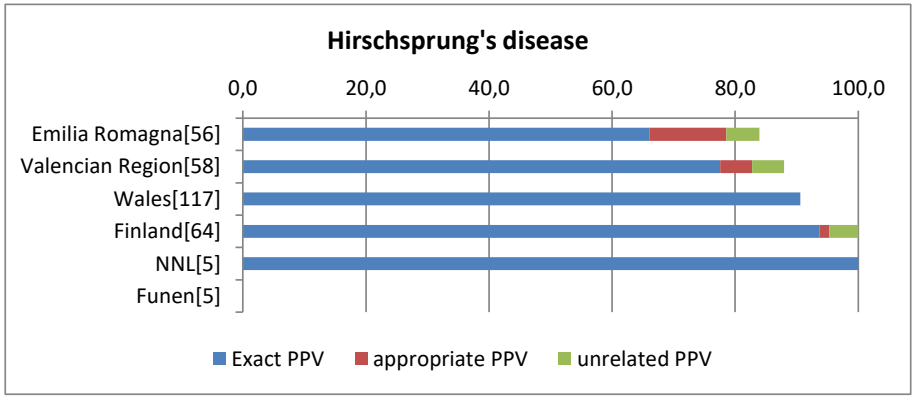




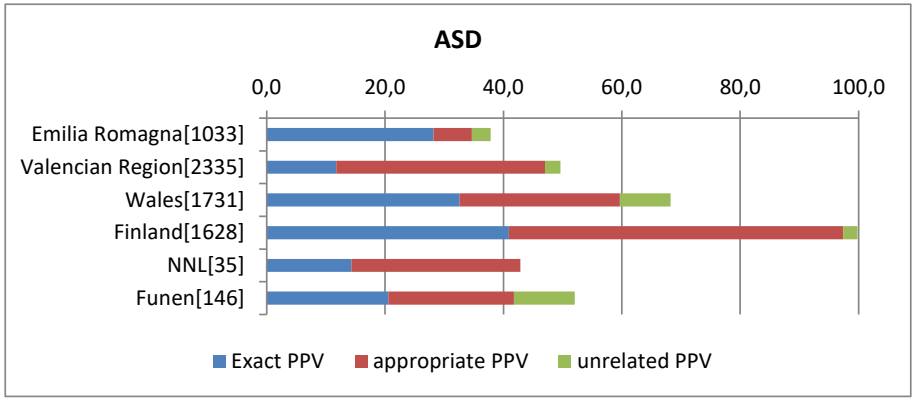
III Anomalies diagnosed after discharge of maternity unit

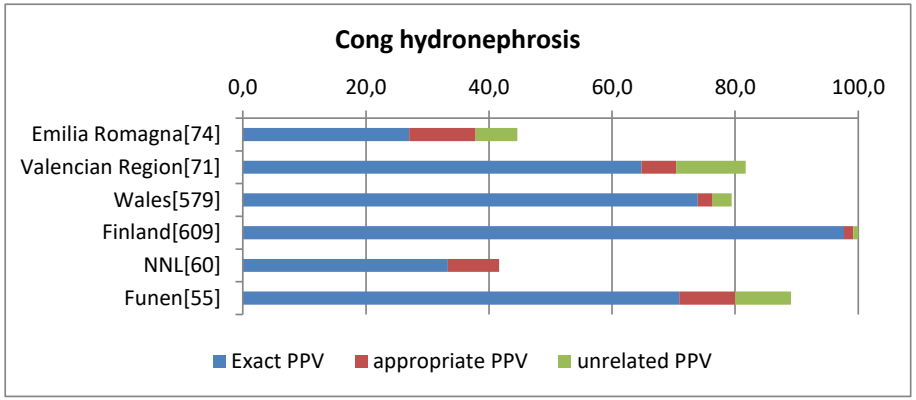


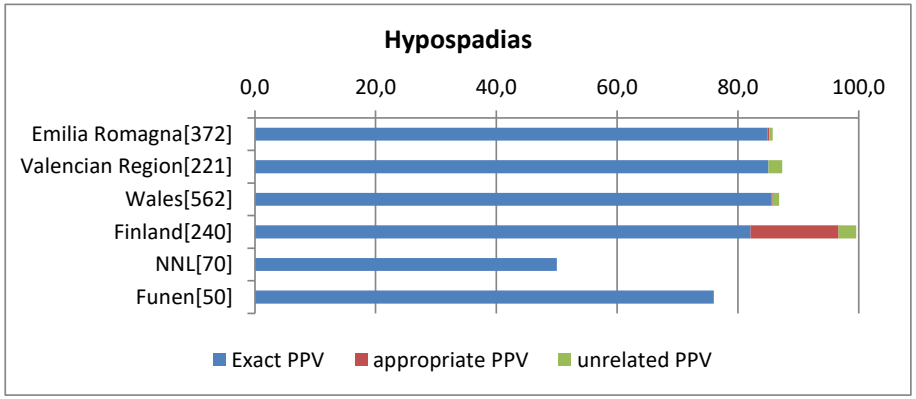




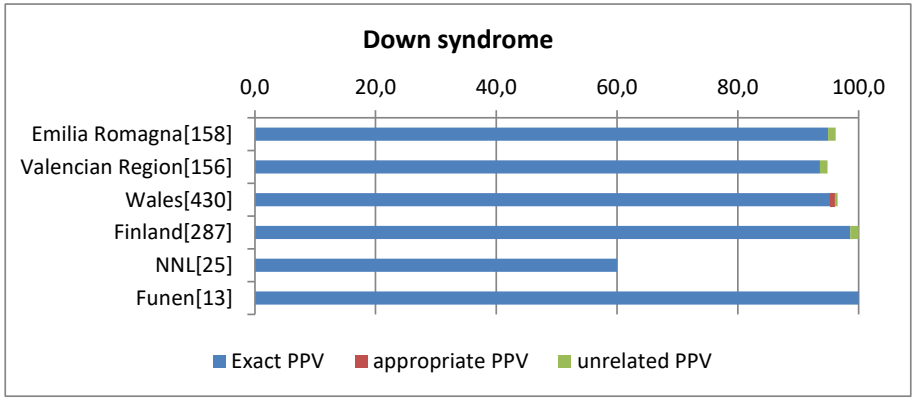
IV Anomalies with grey zone between normal and abnormal

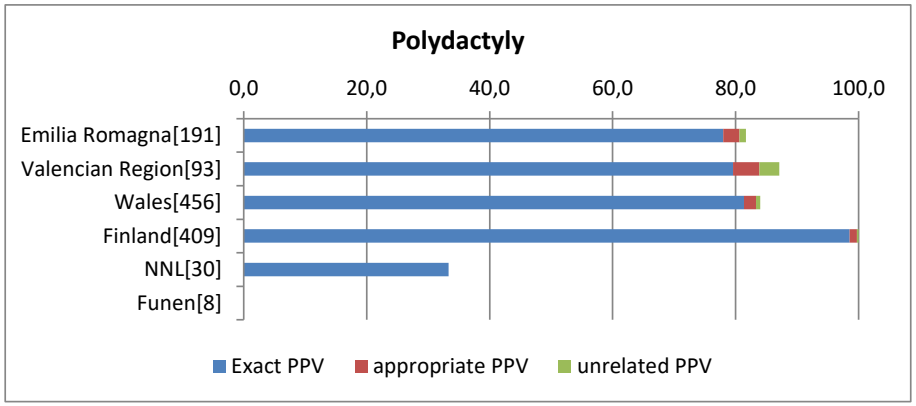






V Chromosomal and mild anomaly





PART 2 Algorithms for use of health care databases to improve the surveillance of congenital anomalies

1 Background

Electronic healthcare databases (HCDs) can be a source of useful data for congenital anomaly (CA) surveillance and research, but only after careful evaluation. EHCDs often have different aims, such as financial reporting, and use coding systems not used in the CA surveillance network. While CA registries in the beginning depended on individual case identification, either sent to the registry by clinicians or actively searched for in clinical records, the last decade has seen an increase in the use of EHCDs as a data source for identifying cases. The possibility for registries to ascertain cases by searching for CA codes in hospital discharge databases is becoming more widespread.

Registries and researchers using EHCDs for studying CAs may use algorithms to discriminate between true cases and suspected or minor cases (1). As there are many grey zones in the definition of major CAs, access to medical records including results of specific examinations (MR scan, echocardiography, genetic tests, *post-mortem* examinations) may still be necessary for correct interpretation of the cases (2). An example of this is an atrial septal defect (ASD) where echocardiography performed in the neonatal period in most cases will show a flow over the atrial septum, as the *foramen ovale* from fetal life has not yet closed. Many clinicians will code this as ASD in the discharge letter despite the benign nature of this finding (3).

An algorithm for CA ascertainment was first developed by the IMER registry (Emilia-Romagna, Italy) in order to extract cases from the Regional EHCDs and verify them. It has been used since 2009 with successive modifications to improve accuracy. The Sicily registry (Italy) has subsequently developed its own algorithm, drawing from a 2013 article that described the IMER algorithm (1). The register of the Puglia Region (Italy) also used the IMER algorithm to process its data, while the Mantova registry (Italy) data were used as a gold-standard comparison in order to verify the performance of the IMER algorithm (4). Currently, the Tuscany registry (Italy) is in touch with IMER, also aiming to use the algorithm on their data. This successful Italian experience has been integrated with information from EUROCAT registries to create a more general algorithm applicable to varying situations.

Some EHCD may include information concerning pregnancy losses, including terminations for fetal anomalies (TOPFA). An algorithm has been developed to identify chromosomal anomalies in these EHCDs (5). However, the algorithm presented here searches for cases with CA only in newborns, as there are very few EHCDs that do contain the necessary information on pregnancy losses and the aim was to develop an algorithm for general use.

1.1 Limitations that may occur in some health care databases (HCDs) for CA registration

1. The number of diagnoses that can be recorded for each case may be limited (e.g. SDO database in Italy only records 6 diagnoses)

2. There can be CA codes that include multiple CAs: the text description associated with the CA code is often generic with frequent use of generic codes (e.g. Other anomaly of face and neck)
3. Codes may be used for reimbursement so more serious conditions are recorded.
4. Where no hospital care is required the CA may not be reported (e.g. Down's syndrome in Sicily)
5. A high number of minor anomalies is recorded
6. Conditions that may resolve after birth are recorded (e.g. PDA at <37 weeks GA)
7. In some cases, a generic code is used instead of a specific one e.g. in ICD9-CM, the detail in the defect coding rarely reaches the fifth digit
8. Inaccurate identification and classification of anomalies. Some anomalies have an ICD9-CM macrocode that includes several ICD9-BPA or ICD10 codes
9. Inappropriate coding (wrong ICD9, ICD9 of adult and not newborn e.g. hydrocephalus Q03.0 in the newborn and Q91.0 in the adult)
10. Generic coding such as "Not otherwise specified" (NOS), "Not Elsewhere Classified" (NEC), "Without other indications" (SAI) and "Not indicated elsewhere" (NIA) which make the case doubtful and of poor reliability
11. Some CAs may be due to prematurity and require further confirmation and follow-up after the neonatal period e.g. Severe microcephaly.
12. The confirmation of the case requires medical evaluation and the need to request clinical information available in the clinical file, with considerable expenditure of time and energy.
13. No text description available or only standard generic text options can be used in the EHCD
14. Local adaptions of ICD9 and ICD10 use other 4-digit codes than the EUROCAT coding system (ICD/BPA10) which means that coding of rare anomalies must be done by coding experts inside the registry

2 Purpose of the Algorithm

The developed algorithm aims to reduce the limitations of EHCDs listed above by using filters and evaluation criteria applicable to all selected CAs with the ultimate aim of classifying the individual patients into three categories:

- Validated cases whose data will be included automatically into the CA registry
- Excluded cases whose data will not be included into the CA registry
- Cases to be evaluated whose data need further consultation of medical records to ascertain the presence/absence of CA.

The main objective of the algorithm is to minimise the number of cases to be evaluated, without increasing the probability of error in the validated cases (false positives) and in those excluded (false negatives).
The probability of error and the reliability of the classification depends on the quality of the information, the effectiveness of the filters and the criteria applied. The results from the algorithm should be considered as probabilistic evaluations.

The algorithm logic follows EUROCAT Guide 1.4 https://eu-rd-platform.jrc.ec.europa.eu/eurocat/data-collection/guidelines-for-data-registration#inline-nav-2 and can be implemented by any registry. The full algorithm details are provided in the appendices.

3 Enhancing an Existing Algorithm

The IMER CA Registry team, based at the University of Ferrara (UNIFE), planned to use the experience of the EUROCAT registries in identifying major CAs by examining medical records, to enhance their existing algorithm, which had already been proven to be effective (4).

3.1 Questionnaire on use of Healthcare databases for CA identification

A questionnaire was developed to see if registries use EHCDs, how they use them and if they have any algorithms/rules of their own. The questionnaire included the list of limitations of EHCDs listed above (see questionnaire - Appendix 1). All EUROCAT registries were provided with a link to the questionnaire and were asked to complete it. There were 19 replies out of the 49 member registries (39%) allowing information to be collected comparing data extraction methods and data validation (see Appendix 2 Results of the Questionnaire). Following this, individual teleconferences were conducted with the CA registries of Scotland (CARDRISS), Northern Netherlands, Denmark (Odense), and England (NCARDRS), as these registries indicated that they had experience in using algorithms to extract data from EHCDs.

The information collected about data management in the EUROCAT registries that completed the questionnaire was used to understand the limitations current ascertainment methods present and how the algorithm used in the IMER registry can be best adapted to their needs.

3.2 Workshop on use of Healthcare databases for CA identification

The algorithm involves a series of decisions made using the diagnoses codes in the EHCD. Four tables based on Central Nervous System (CNS) anomalies and Congenital Heart Defects (CHD) were prepared to illustrate the decisions that are embedded in the algorithm.

- **1. Definite Major CA:** a table of ICD 10 Q codes, that if reported in an EHCD are considered to be appropriate major CAs and the case can be added directly to the CA registry without checking further information manually
- **2. Problematic codes for Minor CAs:** a table of ICD 10 Q codes from the EUROCAT list of minor/excluded codes which may have been used incorrectly by the clinicians to code a major CA
- **3. Additional codes that might indicate a CA in the infant:** a table of codes outside the chapter Q that are considered by EUROCAT to be true CAs or codes of the same pathology that could have been interchanged with those of the adult (e.g. hydrocephalus Q03.0 in the newborn and G91.0 in the adult); to improve the quality of the information, the latter should be checked manually.
- **4. Additional information that may help in decision making: a table of** ICD 10 Q codes with additional information available in the EHCDs that would indicate the need to look at the case in greater detail (for example If a baby has microcephaly and is premature then more information is needed)

During the EUROlinkCAT Annual Consortium Meeting (16 Nov 2021) a breakout session was held in which EUROlinkCAT researchers and also EUROCAT registry staff reviewed these draft tables and provided suggestions for their enhancement. The results were then integrated into the tables that cover all the malformation groups. (See Table 10, Appendix 5)

4. Overview of Algorithm Methodology

These tables are examples to illustrate the algorithm. The full tables for all CAs are available in Appendix 5.

4.1 Healthcare databases for CA identification

A single EHCD can be used for the algorithm or several data sources can be merged. The design of the originating database requires all the key variables involved in the decision-making processes to be present but may also contain other useful patient information. In this report, only the variables involved in the functioning of the algorithm are taken into consideration. In all the sources used, each patient (child) is uniquely identified by the patient code (primary key).

The datasets that may make up the database are the following:

• Hospital discharge records

• Surgical Procedures dataset

• Other sources: e.g. birth certificates

An example of the structure of the input record for the algorithm is described in Table 1.

4.2 Description of the algorithm process

The algorithm searches for possible cases by running **five** modules in sequence:

1. Search for diagnosis to be excluded or evaluated

2. Validation of the diagnosis

3. Analysis of the case

4. Case classification

5. Analysis output

1. The first module examines the EHCD records for all births and divides them into three groups:

- Healthy birth so no diagnosis plus diagnosis of a disease for exclusion
- CA to be evaluated
- EUROCAT minor or excluded CA

2. The second module analyses the diagnosis and reclassifies them according to the following criteria:

- Presence of surgery or other specific procedure
- Presence of clinically validated CA
- Presence of the CA in another EHCD
- Presence of the same CA in several hospital records of the same child
- Presence of several CA in the same record
- Presence of generic CA with a low probability of confirmation

3. The third module analyses the case in question identifying it as:

- Validated case
- Case to be evaluated
- Excluded case

4. The fourth module analyses only the validated cases to classify them as:

- Case with isolated CA
- Case with isolated congenital heart disease
- Chromosomal case
- Syndromic case
- Case with multiple CA

5. The fifth module stores the results of the analysis into output files.

5 Algorithm flowchart

The algorithm presented here provides checks for anomalies of two organ systems: the Central Nervous System (CNS) and Congenital Heart Diseases (CHD) to illustrate the methodology. Tables that permit the selection of cases for other organ systems are available in Appendix 5. All tables enable the selection of major CAs consistent with EUROCAT Guide 1.4 (https://eu-rd-platform.jrc.ec.europa.eu/eurocat/data-collection/guidelines-for-data-registration#inline-nav-2).

5.1 Data Preparation

The data are ordered by patient ID code (primary key) and date of hospital stay, so all hospital stays for one patient are grouped chronologically allowing the possibility for checking whether the CAs have been identified at birth or subsequently.

Each patient is processed separately with the variables organised into three sets:

(i) Identifying information and information from birth certificate: patient code, birth date, gestational age at birth, CA codes possibly included in birth certificates

(ii) Hospital stay and discharge dates (according to the hospital stay progressive number)

(iii) Diagnosis, procedures, classification of diagnosis (according to the hospital stay progressive number and to the order of the diagnosis/procedures/classifications, as reported in Table 2)

Each row corresponds to the information from one hospital stay.

For each patient, a "**CA classification matrix**" is created where each single diagnosis code is assigned a score from 1 to 10, which indicates the probability of the diagnosis being a CA or not (1=most likely and 10=least likely), as shown in Table 2.

5.2 Module 1. Search codes for CAs to exclude or evaluate

Each code is classified according to Table 2 by following the steps below:

Step 1.1 Classification into "Not a CA, excluded' or 'to be evaluated'

The code(s) in the EHCDs compared to ICD10 Q Chapter and EUROCAT added major CA codes for Cas (EUROCAT all anomaly subgroup). Where the local EHCD uses ICD9CM or ICD9 BPA the same procedure can be conducted (see https://eu-rd-platform.jrc.ec.europa.eu/system/files/public/JRC-EUROCAT-Section-3.5_7_Oct_2021.pdf). If the code is within the Q Chapter, the case is classified as "to be evaluated" (score 6 in Table 2). If the code is not included the diagnosis is classified as "to be excluded" (score 10 in Table 2).

For example, for CNS anomalies: if the diagnosis code is ICD10 and starts Q0 it is classified as “to be evaluated”. Similarly, for CHD ICD10 codes starting with Q2 are classified as “to be evaluated”.

The “to be excluded” codes undergo a final check prior to exclusion against a list of inappropriate codes or codes outside the defined range for malformations that may indicate a CA. For example, the code corresponds to the same diagnosis in adults. If this occurs the inappropriate code is replaced by the assumed correct code and the diagnosis is re-classified as ‘to be evaluated’ (score 6 in Table 2). Table 3 lists these codes and provides the correct codes to replace the inappropriate ones (only for CNS and CHD). The choice of inappropriate codes must be customised considering the EHCD used.

Step 1.2 Search for minor CAs to be excluded

Only if the case in question contains at least one diagnosis ‘to be evaluated’.

The EUROCAT classification of minor malformations is used to exclude minor defects when isolated. These minor anomalies are included when associated with a major anomaly (JRC-EUROCAT-Section-3.2-23-9-2020.pdf (europa.eu). However, each EHCD varies and may include other minor congenital defect codes that are considered “non-malformative defects” such as tongue tie Q381 and enlarged nails Q845. These need to be excluded both in isolated and associated form but are not mentioned in the EUROCAT Guide 1.4 list of minors. The list of excluded minor anomalies is shown in Table 4 (for CNS and CHD only).

If the code is found, the pathology is excluded and re-classified as ‘not a congenital anomaly’ (score 10 in Table 2).

Step 1.3 Search for minor CAs

Only if the case in question contains at least one diagnosis ‘to be evaluated’.

For EUROCAT registration a case is excluded if it is isolated with only a minor code, while it is kept if it is associated with a major CA (Table 5). In this stage of the algorithm, all cases with minor CAs are kept (score 8 in Table 2). The following steps verify if the minor CA is isolated or associated with another CA.

Step 1.4 Use of specific exclusion criteria

Only if the case in question contains at least one diagnosis ‘to be evaluated’.

Both the persistence of the defect after birth and the specific clinical condition of the child are factors leading to the inclusion or exclusion of a case (score 9 in Table 2). EUROCAT rules can be applied to specific anomalies:

- Clinical criteria: specific CA diagnosis should be excluded if observed only at birth. Atrial septal defect/foramen ovale may resolve spontaneously after the first few months of life and needs to be confirmed at 6 months. Prematurity is the leading cause for patent ductus arteriosus, which can be considered a confirmed CA diagnosis for EUROCAT only in term infants. Hydrocephalus in preterm infants which is often caused by cerebral haemorrhage rather than a CA but it is important to identify the few preterm born infants with congenital hydrocephaly. The length of hospital stay and the gestational age are useful to evaluate the severity of the clinical presentation of the hypothetical congenital diagnosis.
- Specific healthcare system experience: in particular regarding non-specific codes, excluding diagnosis when observed only at birth or associated to a short hospital stay, may help avoid the erroneous inclusion of minor anomalies (e.g. the single code "other specified congenital malformations of brain" with a short hospitalisation at birth is associated with the diagnosis of choroidal plexus cysts in healthy infants examined with brain ultrasound).

The exclusion criteria used are listed in the 'Exclusion criteria Table' (Table 6). Further parameters can be added to this table to improve the performance of the filters or to exclude more diagnoses, depending on the specific contexts.

5.3 Module 2. Validation of CAs

Step 2.1 Search of hospital stays with two or more codes for CAs

This step analyses only the diagnosis to be evaluated.

If there is more than one diagnosis to be evaluated in the hospital stay in question, and the codes for these diagnosis concern different organ systems, the diagnosis are validated, re-classified, and the case is considered as 'possibly multiple CA' (score 5 in Table 2).

Step 2.2 Search of same CA in more hospital stays

This step analyses the diagnosis to be evaluated, the validated ones, and the excluded ones.

When the same CA diagnosis (same organ system) is detected in two or more hospital stays in the same or different hospital departments, the probabilities of error are considered minimal and the diagnosis is validated. Two hospital stays are distinct if the difference between the previous discharge date and the subsequent entry date is above a cut-off defined by the Registry.

Furthermore, some CA diagnoses which were excluded in module 1 are re-analysed here. If the same diagnosis is observed in a hospital stay of at least 15-30 days after the birth (depending on the local context), the reason for exclusion because preterm or for short hospitalisation (see step 1.4) fails.

To classify two CA diagnoses as belonging to the same organ system, the codes might coincide, but it is also sufficient that the codes identify the same organ system. Diagnosis thus identified are

'validated' and the case is re-classified as having a diagnosis present in more than one hospital stay (score 4 in Table 2).

Step 2.3 Search of same CA in birth certificates

This step analyses the diagnosis to be evaluated and the validated ones.

Birth certificates may contain fields that are specific for the diagnosis of the child and possibly include codes of CA diagnosis observed in the first days of life.

If at least one of the CA diagnosis codes in the birth certificate belongs to the same organ system as the CA diagnosis under evaluation, this is re-classified as 'validated' (score 3 in Table 2).

Step 2.4 Search of clinically validated CAs

This step analyses the diagnosis to be evaluated and the validated ones.

Not all CA diagnoses observed and registered in healthcare databases must be checked through standardised procedures. There are clinically apparent defects that can easily be recognised by a physician without further checks. Externally visible anomalies such as a limb reduction defect or cleft lip can be considered clinically validated (score 2 in Table 2). A list of these diagnoses is shown in Table 7 (for CNS and CHD only).

Step 2.5 Search of association between Cas and specific procedure (surgical or other)

This step analyses the diagnosis to be evaluated, the validated ones, and the excluded ones.

Based on the analyses of local healthcare databases, it may be possible to find clear agreement between some CA diagnosis and their specific procedures. These associations are listed in the 'Table CA-procedures' (Table 8). In particular specific surgery codes can confirm the presence of a CA. Table 8/A lists the surgery codes commonly used in several European countries, Since the diagnosis in question is associated with all the procedures the child has undergone during the hospital stay, each diagnosis code – procedure code pair in Table 8 can be searched for and if found the diagnosis in question is re-classified as 'validated' (score 1 in Table 2).

Some diagnoses excluded in the module 1 (see step 1.4) are re-analysed here: the algorithm could be set such that if the CA diagnosis is associated with a specific surgical procedure, the presence of prematurity or short hospitalisation will be ignored.

Step 2.6 Search of low probability CAs to be evaluated

This step is performed only if there is at least one diagnosis to be evaluated.

The clinical records of the child require checking to confirm the presence of a diagnosis when the probability of a CA to be evaluated is low. This requires qualified personnel, as well as time and

energy. To minimise the personnel requirements for this purpose, when the diagnosis in question belongs to a generic or unspecified condition, the case is removed from the cases 'to be evaluated' and added to a group with a low probability of validation.

The diagnosis is considered generic or unspecified when it belongs to one of the categories listed in the 'Table of Unspecified CAs' (Table 9). Generally these codes are:

- Not otherwise specified
- Without other indications
- Not indicated elsewhere
- Other undefined conditions (ICD 9)

All diagnoses belonging to this list are re-classified as 'low probability CAs to be evaluated' (score 7 in Table 2).

5.4 Module 3. Case analysis

In this module all diagnoses for the case are analysed.

Step 3.1 Classification into 'validated', 'excluded', or 'to be evaluated'

This process assigns the case to the groups: 'validated', 'excluded', or 'to be evaluated'. The algorithm assigns a number between 1 and 10 to the case, using limits and definitions as described previously (Table 2). Therefore, the case is considered:

- **Validated:** when at least one of the diagnoses has a score between 1 and 5
- **To be evaluated:** when the case has not been validated and at least one of the diagnoses has a score between 6 and 7
- **Minor:** when the highest score any diagnoses has is 8 (an isolated minor CA)
- **Excluded:** when the highest score any diagnoses has is 9 or 10

5.5 Module 4. Case classification

This module is run only if the case in question is validated.

First, the validated CA diagnosis is searched and the corresponding codes are analysed. The validated case is examined further and categorised into the following categories and sub-categories:

- Isolated case
  - Case with isolated CHD
  - Case with an isolated CA that is not a CHD
- Case with associated CA
  - Case with multiple CA
  - Case with a chromosomal anomaly
  - Case with a genetic syndrome

Step 4.1 Case with other isolated CA

If one or more validated diagnoses are present with codes belonging to the same organ system. For a better quality of classification, it is advisable to integrate the algorithm with specific software for the identification of isolated malformations, multiple malformations and chromosomal malformations (publication by Ester Garne).

Step 4.2 Case with multiple CAs

If there are more validated CA diagnoses from the same hospital stay with codes belonging to different organ systems.

Step 4.3 Case with isolated CHD

If all validated CA diagnoses have a code within the appropriate interval of CHD.

Step 4.4 Case with a chromosomal anomaly

If there is at least one validated CA diagnosis with a code within the appropriate intervals for chromosomal anomalies, as automatically identified by the algorithm.

Step 4.5 Genetic syndrome

This categorisation is complex as each syndrome may have a specific ICD9 or ICD10 diagnosis, often partly involving the two organ systems considered in the present work. In order to classify correctly cases with genetic syndromes, we propose to use the EUROCAT Syndrome Guide (EUROCAT Syndrome Guide Revision Final version September 2017.pdf (europa.eu)). The algorithm will consider the case as genetic syndrome if at least one validated CA diagnosis has a code in the EUROCAT syndrome guide. Should there be the need to add other known conditions to the syndrome, all the desired known conditions can be added. The hospital databases with often use ICD9 or ICD10 diagnosis "other specified syndrome" while the coding in EUROCAT requires use of the ICD10/BPA extended codes where more syndromes can be given a unique code the syndrome diagnosed.

5.6 Module 5. Analysis output

Data can be saved into one or more files, *validated cases* – the output file contains all cases with a validated diagnosis and also includes information on all their other possible minor diagnoses

- *cases to be evaluated* – the output file contains the cases with a diagnosis to be evaluated manually, the minor CAs, and the CAs excluded by filters

- *excluded cases* – the output files contain cases only with minor diagnoses, diagnoses excluded by filters, and other diagnoses not relevant for the CA registry

Since the decision processes are based on probabilistic analyses, it is advisable to check the cases together with an expert clinician, whenever possible. All of the algorithm's output can be reviewed by clinicians, however, it will in any case be used to produce a final database containing only the 'validated' diagnosis, whether they were categorised as such directly by the algorithm, or they belonged to the 'to be evaluated' file and were subsequently validated by a clinician. In the final database, if a case has multiple diagnoses, it still counts as a single case. In the final CA database, a case with multiple diagnoses contributes to both the number of malformed cases and the number of malformations in any analysis.
Finally, since the EUROCAT network utilises the ICD-10 coding, data using different codes should be transformed before transmitting it to EUROCAT or comparing a registry's output with the EUROCAT prevalence tables.

6 Discussion

A previously reported Italian study tested the effectiveness of using an algorithm by comparing it to registry data where all cases were clinically validated (Astolfi *et al.* 2016) and the comparison confirmed the validity of the algorithm with the following results:

• PPV 93% in validated cases

• NPV 94% in excluded cases

• NPV 58% and PPV 42% in the cases to be evaluated

6.1 Strengths and weaknesses

The use of computer files and EHCD can help improve the coverage and ascertainment of CAs with low resource usage. The proposed algorithm allows surveillance of all or specific congenital anomalies exclusively through healthcare databases, and the use of electronic health records may ensure a sufficiently complete coverage of geographical areas. This general algorithm can be improved through experience with the EHCD in question. Where a CA Registry is already present, the algorithm may be used to improve ascertainment of cases and to integrate the cases identified by healthcare professionals. A clear advantage is also the speed with which large databases can be analysed, reducing to a minimum the cases which need to be confirmed by checking the clinical records. Indeed, 'validated' cases have low likelihood of being false positives, and 'excluded' cases have low likelihood of being false negatives, therefore both categories do not require manual

checking of the clinical records. Furthermore, the algorithm relies on tables which allow tailoring the process to local needs without the need to change the code. The results of the algorithm can be compared across Registries which use the same process leading to continuing improvement not only of the CA Registry but also of the EHCD.

The algorithm also has weaknesses which must be considered. The quality of the information on CAs in healthcare databases depends on the coding used by the doctors and secretaries which may be inferior to the quality of information provided by healthcare professionals in the medical records. Detecting very rare or severe anomalies referred out of the region may require access to databases covering other geographical areas. The algorithm only captures CA diagnoses performed during a hospital stay. If the infant die shortly after birth and the CA diagnosis is made at postmortem examination or results of the karyotype/genetic tests are available after the death, these diagnoses are not included in the EHCD. The algorithm also does not include terminations of pregnancy for fetal anomaly (TOPFA) that are essential for surveillance of more severe anomalies with a high rate of prenatal diagnosis and termination of pregnancy. The category of cases 'to be evaluated' requires checking clinical records which may be time consuming. While 'validated' and 'excluded' cases have strong evidence of a validity of the CA they are not categorised with absolute certainty. The use of EUROCAT Guide 1.4 is essential as well as feedback to and training for coders in the area covered by the EHCD regarding accuracy and appropriateness of codes are required. Clinical involvement in cases remains important in order to validate more complex cases e.g. syndromes and it is advisable to check at least a sample of cases with a clinical expert.

7 Publication of results

The results will also be included in deliverable D8.3: "Report to EU institutions hosting health care databases with guidelines for improving the quality of the congenital anomaly coding" by month 65 (May 2022)

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For access to the full algorithm please contact:
Dr. Gianni Astolfi
Department of Neuroscience and Rehabilitation
University of Ferrara
asg@unife.it

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CARDRISS, Scotland
Stephen Bush
Anna Goulding

Northern Netherlands
Hermien De Walle
Nicole Siemensma
Renée Lutke

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Ester Garne

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Jennifer Broughan
Nicola Miller
Donna Lloyd

Valencian Region, Spain
Clara Cavero Carbonell

National Register of Congenital Anomalies, Republic of Moldova
Natalia Barbova
Vladimir Egorov

PREDA, Latvia

Inese Ledina

Polish Registry of Congenital Malformations, Wielkopolska and Poland
Anna Materna-Kiryluk
Anna Latos-Bielenska

Spanish Collaborative Study of Congenital Malformations (ECEMC), Spain
Eva Bermejo-Sanchez

South Portugal
Paula Braz

Malta Congenital Anomalies Register
Miriam Gatt

Antwerp, Belgium
Elly Den Hond

Mainz, Germany
Awi Wiesel

Zagreb, Croatia
Ljubica Boban

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Lyubov Yevtushok

Registry of Congenital Anomalies of Milan, Italy
Maria Teresa Greco

Styria, Austria
Martin Haeusler

Vaud, Switzerland
Marie-Claude Addor

Malformation Monitoring Centre Saxony-Anhalt, Germany
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PART 2 Tables

Table 1: Basic database structure

Field	Description
CodPat	PATIENT IDENTIFICATION CODE (PRIMARY KEY)
B_Date	BIRTH DATE
Dt_Adm	HOSPITAL STAY DATE
Dt_Dim	DISCHARGE DATE
Pat1	FIRST DIAGNOSIS CODE
…	OTHER DIAGNOSIS CODES
Pat(N)	LAST DIAGNOSIS CODE
Proc1	FIRST PROCEDEURE CODE
…	OTHER PROCEDURE CODES
Proc(N)	LAST PROCEDURE CODE
Gest_L	GESTATION WEEKS (BIRTH CERTIFICATE)
MAL1	FIRST MALFORMATION CODE FROM BIRTH CERTIFICATE
MAL2	SECOND MALFORMATION CODE FROM BIRTH CERTIFICATE
MAL3	THIRD MALFORMATION CODE FROM BIRTH CERTIFICATE
…	OTHER VARIABLES AS NEEDED BY THE REGISTRY TO COMPLETE PATIENT'S DATA

Table 2: Classification of diagnosis and description of filters

Classification score	Filter description
1	CA IS ASSOCIATED TO A PROCEDURE SPECIFIC FOR THAT CA
2	CA BELONGS TO A GROUP OF CONGENITAL DEFECTS WHICH ARE CLINICALLY VALIDATED
3	SAME CA WAS REGISTERED IN MORE THAN ONE HEALTHCARE DATABASE SOURCE (E.G. HOSPITAL RECORDS AND BIRTH CERTIFICATE)
4	SAME CA IN MORE THAN ONE HEALTHCARE DATABASE SOURCE (E.G. MORE THAN ONE HOSPITAL RECORD)
5	MORE CA BELONGING TO DIFFERENT SYSTEMS FOUND IN THE SAME SINGLE HEALTHCARE DATABASE RECORD
6	CA HAS A CODE INCLUDED IN A SPECIFIED INTERVAL AND IS TO BE EVALUATED
7	CA HAS A CODE INCLUDED IN A SPECIFIED INTERVAL WHERE THE PROBABILITY IS LOW THAT IT IS A TRUE CA
8	CA CLASSIFIED AS MINOR
9	CA HAS A CODE INCLUDED IN A SPECIFIED INTERVAL, BUT WAS ELIMINATED BY THE EXCLUSION CRITERIA
10	NOT A CA, EXCLUDED

The numbers are attributed to cases after processing with the algorithm.

Table 3: CAs with inappropriate coding (CNS, CHD and Other groups)

ICD10	ICD9-CM	Diagnosis	Correct ICD10	Correct ICD9-CM
CNS				
G91.0	3313	COMMUNICATING HYDROCEPHALUS	Q03.0	7423
G91.1	3314	OBSTRUCTIVE HYDROCEPHALUS	Q03.0	7423
G91.8	-	OTHER HYDROCEPHALUS	Q03.8	-
G91.9	-	HYDROCEPHALUS, UNSPECIFIED	Q03.9	-
G93.0	3480	CEREBRAL CYSTS	Q04.6	7424
CHD				
I51.0	-	CARDIAC SEPTAL DEFECT	Q21.8	-
I52.8	-	OTHER HEART DISORDERS IN OTHER DISEASES CLASSIFIED ELSEWHERE	Q24.9	-
Other				
D82.1	27911	DIGEORGE VELOCARDIOFACIAL SYNDROME	D82.1	27911
E72.0	-	OCULO-CEREBRO-RENAL SDR OF LOWE	E72.0	-
P02.3	7623	TWIN TO TWIN TRASFUSION (TRAP S.)	P02.3	7623
P35.1	7711	CITOMEGALOVIRUS	P35.1	7711
P35.0	7710	CONGENITAL RUBELLA	P35.0	7710
P35.8	-	ZIKA VIRUS	P35.4	-
P37.1	7712	TOXOPLASMOSIS	P37.1	7712
P70.1	7750	NEWBORN SYNDROME OF DIABETIC MOTHER	P70.1	7750

Table 4: CAs that are not included in the EUROCAT list of minors and should be excluded regardless of whether there is a major congenital anomaly present or not (CNS and CHD groups only)

ICD10	ICD9-CM	Diagnosis
CNS		
Q07.80	-	MARCUS-GUNN'S SYNDROME
CHD		
Q24.6	74686	CONGENITAL HEART BLOCK

Table 5: Minor CAs as specified by EUROCAT (CNS and CHD groups only)

ICD10	ICD9-CM	Diagnosis
CNS		
Q04.61	7424	SINGLE CONGENITAL CEREBRAL CYST
CHD		
Q21.11	7455	PATENT OR PERSISTENT FORAMEN OVALE
Q26.1	-	PERSISTENT LEFT SUPERIOR VENA CAVA
Q25.41	-	PERSISTENT RIGHT AORTIC ARCH
Q27.0	7475	ABSENCE OR HYPOPLASIA OF UMBILICAL ARTERY, SINGLE UMBILICAL ARTERY
Q89.9	7599	CONGENITAL MALFORMATION, UNSPECIFIED

Table 6: Exclusion filters for selected CAs (CNS and CHD groups only)

ICD10	ICD9 CM	Diagnosis	Premature	Short length of stay in hospital†	AND /OR
CNS					
Q02	7421	MICROCEPHALY	YES		
Q03.8	7423	OTHER CONGENITAL HYDROCEPHALUS	YES		
Q03.9	-	CONGENITAL HYDROCEPHALUS, UNSPECIFIED	YES		
Q04.3	7422	OTHER REDUCTION DEFORMITIES OF BRAIN	YES	YES	AND
Q04.8	7424	OTHER SPECIFIED CONGENITAL MALFORMATIONS OF BRAIN	YES	YES	AND
-	74259	OTHER ANOMALIES OF THE SPINAL CORD NOT SPECIFIED	YES	YES	OR
Q04.9	7428	CONGENITAL MALFORMATION OF BRAIN, UNSPECIFIED	YES	YES	AND
Q07.8	7428	OTHER SPECIFIED CONGENITAL MALFORMATIONS OF NERVOUS SYSTEM	YES	YES	AND
Q07.9	7429	CONGENITAL MALFORMATION OF NERVOUS SYSTEM, UNSPECIFIED	YES	YES	OR
CHD					
Q21.0	7454	VENTRICULAR SEPTAL DEFECT	YES		
Q21.10	-	ATRIAL SEPTAL DEFECT	YES		
Q21.8	7458	OTHER CONGENITAL MALFORMATIONS OF CARDIAC SEPTA		YES	
Q21.9	7459	CONGENITAL MALFORMATION OF CARDIAC SEPTUM, UNSPECIFIED		YES	
Q25.0	7470	PATENT DUCTUS ARTERIOSUS	YES		
Q24.9	74689	OTHER NOT SPECIFIED ANOMALIES OF THE HEART	YES	YES	AND
Q24.9	7469	NOT SPECIFIED ANOMALIES OF THE HEART	YES	YES	AND
Q28.8		OTHER SPECIFIED CONGENITAL MALFORMATIONS OF CIRCULATORY SYSTEM		YES	
Q28.9	74729	CONGENITAL MALFORMATION OF CIRCULATORY SYSTEM, UNSPECIFIED		YES	

† = Short length of stay is a stay less than the median number of days for healthy births

Table 7: Clinically validated CAs (CNS and CHD groups only)

ICD10	ICD9-CM	Text Description
CNS		
Q00.00	7400	ANENCEPHALIA
Q01	7420	ENCEPHALOCELE
Q05	741	SPINA BIFIDA
CHD		
Q20.0	7450	COMMON ARTERIAL TRUNK
Q20.3	7451	TRANSPOSITION OF LARGE VESELS
Q20.4	7453	UNIQUE VENTRICLE
Q21.3	7452	TETRALOGY OF FALLOT
Q21.0	7454	VENTRICULAR SEPTAL DEFECT
Q22.5	7462	EBSTEIN'S ANOMALY
Q25.1	7471	COARCTATION OF AORTA
Q23.4	7467	HYPOPLASIC LEFT HEART SYNDROME

Table 8: Procedures that will validate the CA code (CNS and CHD groups only)

ICD10	ICD9-CM	Procedure code †	Procedure
CNS			
Q0	740-742	022	VENTRICULOSTOMY
		034	REMOVAL OR DEMOLITION OF INJURY OF THE CORD OR SPINAL MENINGES
		0124	OTHER CRANIOTOMY
		0125	OTHER CRANIECTOMY
		0131	INCISION OF THE CEREBRAL MENINGES
		0212	OTHER REPAIR OF THE CEREBRAL MENINGES
		0231	ANASTOMOSIS BETWEEN VENTRICLE AND STRUCTURES OF THE HEAD AND NECK
		0234	ANASTOMOSIS BETWEEN VENTRICLE, ABDOMINAL CAVITY AND ITS ORGANS
		0242	REPLACEMENT OF VENTRICULAR ANASTOMOSIS
		0243	REMOVAL OF VENTRICULAR ANASTOMOSIS
		292	REMOVAL OF CYSTS OR DRESSING OF THE BRANCHIAL CRACK
		0309	OTHER EXPLORATION AND DECOMPRESSION OF THE VERTEBRAL CANAL
		0351	REPAIR OF SPINAL MENINGOCELE
		0352	REPAIR OF SPINAL MYELOMENINGOCELE
		0359	OTHER REPAIRS AND PLASTIC INTERVENTIONS ON THE SPINAL CORD
		0371	SUBARACHNOID-PERITONEAL SPINAL ANASTOMOSIS
		3881	OTHER SURGICAL OCCLUSION OF INTRACRANIC VESSELS
CHD			
Q2	745-7474	351	OPEN HEART VALVULOPLASTY WITHOUT REPLACEMENT
		352	HEART VALVE REPLACEMENT
		359	OTHER INTERVENTIONS ON VALVES AND SEPTUMS OF THE HEART
		390	PULMONARY SYSTEMIC ARTERIAL ANASTOMOSIS
		3503	CLOSED-HEART VALVULOTOMY
		3510	OPEN HEART VALVULOPLASTY
		3521	REPLACEMENT OF THE AORTIC VALVE WITH BIOPROTHESIS
		3523	REPLACEMENT OF THE MITRAL VALVE WITH BIOPROTESIS
		3525	LUNG VALVE REPLACEMENT WITH BIOPROTHESIS
		3528	REPLACEMENT OF TRICUSPID VALVE WITH BIOPROTESIS
		3532	INTERVENTIONS ON CURTAIN ROPES
		3534	INFUNDIBULECTOMY
		3535	INTERVENTIONS ON THE FLESH TRABECULA OF THE HEART
		3539	INTERVENTIONS ON OTHER STRUCTURES ADJACENT TO THE HEART VALVES
		3541	ENLARGEMENT OF EXISTING DEFECT OF THE ATRIAL SEPTUM
		3542	CREATION OF SEPTAL DEFECT IN THE HEART
		3550	REPAIR OF SEPTAL DEFECT

		3554	REPAIR WITH DEFECT PROSTHESIS OF ENDOCARDIAL BEARINGS
		3561	REPAIR OF DEFECT OF THE INTERATRIAL SEPTUM WITH TISSUE GRAFT
		3562	REPAIR OF DEFECT OF THE INTERVENTRICULAR SEPTUM WITH TISSUE GRAFT
		3563	DEFECT REPAIR OF ENDOCARDIAL BEARINGS WITH TISSUE GRAFT
		3581	TOTAL CORRECTION OF FALLOT TETRALOGY
		3582	TOTAL CORRECTION OF COMPLETE ANOMALY OF THE VENOUS PULMONARY CONNECTION
		3583	TOTAL CORRECTION OF THE ARTERIAL TRUNK
		3584	TOTAL CORRECTION OF LARGE VESSEL TRANSPOSITION NOT ELSEWHERE CLASSIFIED
		3591	INTERATRIAL TRANSPOSITION OF THE VENOUS RETURN
		3592	CREATION OF DUCT BETWEEN RIGHT VENTRICLE AND PULMONARY ARTERY
		3593	CREATION OF DUCT BETWEEN THE LEFT VENTRICLE AND THE AORTA
		3594	CREATION OF DUCT BETWEEN ATRIUM AND PULMONARY ARTERY
		3595	REVIEW OF CORRECTIVE PROCEDURES OF THE HEART
		3596	PERCUTANEOUS VALVULOPLASTY
		3711	CARDIOTOMY
		3804	ENGRAVING OF THE AORTA
		3814	ENDOARTERIECTOMY OF THE AORTA
		3834	RESECTION OF THE AORTA WITH ANASTOMOSIS
		3844	RESECTION OF THE AORTA, ABDOMINAL WITH REPLACEMENT
		3921	CAVA AND PULMONARY ARTERY ANASTOMOSIS
		3953	ARTERIOVENOUS FISTULA REPAIR

† Proceedure coding is very specific to each EHCD and must be evaluated separately for each EHCD

Table 8/A: Codes used for SURGERY in different countries

Country	Code
Spain	ICD9-CM
Italy	ICD9-CM
Finland	NORDIC MEDICO-STATISTICAL COMMITTEE CLASSIFICATION OF SURGICAL PROCEDURES (NOMESCO)
Denmark	DANISH VERSION OF THE NORDIC MEDICO-STATISTICAL COMMITTEE CLASSIFICATION OF SURGICAL PROCEDURES (NOMESCO)
England	CLASSIFICATION OF SURGICAL OPERATIONS AND PROCEDURES (OPCS-4)
Wales	CLASSIFICATION OF SURGICAL OPERATIONS AND PROCEDURES (OPCS-4)
Netherlands	CLASSIFICATION OF PROCEDURES (LIKE ICD9-CM)

Table 9: Unspecified CAs (CNS and CHD groups only)

ICD10	ICD9-CM	Diagnosis
CNS		
Q04.8	-	OTHER SPECIFIED CONGENITAL MALFORMATIONS OF BRAIN
Q04.9	-	CONGENITAL MALFORMATION OF BRAIN, UNSPECIFIED
Q07.8	7428	OTHER SPECIFIED CONGENITAL MALFORMATIONS OF NERVOUS SYSTEM
Q07.9	7429	CONGENITAL MALFORMATION OF NERVOUS SYSTEM, UNSPECIFIED
CHD		
Q21.8	7458	OTHER CONGENITAL MALFORMATIONS OF CARDIAC SEPTA
Q21.9	7459	CONGENITAL MALFORMATION OF CARDIAC SEPTUM, UNSPECIFIED
Q24.8	7468	OTHER SPECIFIED CONGENITAL MALFORMATIONS OF HEART
Q24.9	74609	CONGENITAL MALFORMATION OF HEART, UNSPECIFIED
Q24.9	74689	OTHER NOT SPECIFIED ANOMALIES OF THE HEART
Q27.8	74769	OTHER SPECIFIED CONGENITAL MALFORMATIONS OF PERIPHERAL VASCULAR SYSTEM
Q27.9	74729	CONGENITAL MALFORMATION OF PERIPHERAL VASCULAR SYSTEM, UNSPECIFIED
Q28.8	-	OTHER SPECIFIED CONGENITAL MALFORMATIONS OF CIRCULATORY SYSTEM
Q28.9	-	CONGENITAL MALFORMATION OF CIRCULATORY SYSTEM, UNSPECIFIED

Appendices

Appendix 1: Protocol - Accuracy of congenital anomaly coding in live births in healthcare databases

Accuracy of congenital anomaly coding in live births in health care databases

Protocol for a WP6 study (final version 4/10/2019)

Aim of this study:

To evaluate the accuracy and the quality of the ICD coding of congenital anomalies in live births with a diagnosis in the first year of life in health care databases compared to EUROCAT data.

Institution responsible:

University Medical Centre Groningen (UMCG), Groningen, the Netherlands (Eurocat NNL, Hermien de Walle)

Other partners:

PHW NHS – Wales (David Tucker)

BIOEF – Basque (Olatz Mokoroa)

RSD – Denmark (Ester Garne)

THL – Finland (Mika Gissler)

SU – Swansea University (Daniel Thayer)

FISABIO – Spain (Clara Cavero Carbonell)

CNR-IFC – Italy (Anna Pierini)

UNIFE – Italy (Amanda Neville)

KDB – Croatia (Ingeborg Barišić)

SGUL – England (Joan Morris) BINOCAR_NORCAS, BINOCAR_EMSYCAR, BINOCAR_CAROBB, BINOCAR_SWCAR BINOCAR_WANDA

Background

Electronic health care data are increasingly being used by researchers to investigate the epidemiology of congenital anomalies, rather than using information from congenital anomaly registries. Such health care data have often been found to be incomplete(Boulet *et al.*, 2006). Recent studies in the USA estimated that 93% of babies with any congenital anomaly would be identified (Salemi *et al.*, 2016, Wang *et al.*, 2010), but that the proportions identified with specific anomalies is much lower (Salemi *et al.*, 2017). Andrade *et al.* (2013) found only 37% for pregnancies affected with anencephaly were recorded. Frohnert *et al.* (2005) found that 50% of atrial septal defects were

identified and 22% of patent ductus arteriosus. A recent Canadian study reported slightly higher accuracy, but this was based on a very restricted set of congenital anomalies (Blais *et al.*, 2013).

For many populations, a congenital anomaly register may not exist. It is therefore important to develop a set of codes/algorithms that would enable the maximum amount of information to be obtained from electronic health care data. It is also essential to develop such algorithms in regions where a congenital anomaly registry exists in order to ensure that the algorithms used to identify cases/clinical diagnoses will not include differential or unconfirmed diagnoses. Hexter *et al.* (1990) found that diagnoses in the hospital discharge diagnosis index (California,USA) were often less precise which resulted in many anomalies being categorised as 'unspecified' or 'other'. The inclusion of suspected or unconfirmed clinical diagnoses will over-estimate the prevalence of congenital anomalies. A change from suspected diagnosis to confirmed diagnosis might not be reflected in the administrative data of the hospital.

Hospital administrative data are not designed for research or surveillance so the validity of the data is essential. Metcalfe *et al.* (2014) showed in their study that in-hospital data does an adequate job in ascertaining most, but not all congenital anomalies, while other sources of administrative data, particularly data from out-patient physician visits, were not able to do this.

Salemi *et al.* (2018a) showed that the number of diagnostic codes available in the hospital data impacts the ability to identify cases. In the study, for example the ICD9 code '742.1' for microcephaly was listed outside the top 10 codes 20% to 25% of the time; therefore, any changes in the number of diagnosis code fields available for use for each patient could have confounded the trends assessment.

Identifying which specific congenital anomalies can be accurately identified using only routine health care databases will enable the surveillance of these anomalies to be performed worldwide, and not just in regions with congenital anomaly registries. In addition, in regions where a congenital anomaly registry does exist, the use of these algorithms on electronic health care data will provide an additional source of ascertainment and hence will improve the coverage and quality of data in the registries. One study has developed an algorithm which has been tested using data from one single health care database in Europe (Astolfi *et al.*, 2013). Another very recent study from the USA used an algorithm which increased the accuracy of case finding without having to review medical records (Salemi *et al.*, 2018b).

In this EUROlinkCAT study (Accuracy of health care databases) we will evaluate the accuracy and the quality of the ICD coding of congenital anomalies in hospital databases, including outpatient clinics,

compared to EUROCAT data as the gold standard. We will estimate the overall and anomaly specific accuracy for discovering congenital anomalies in hospital databases and make recommendations for coding congenital anomalies in the future. And finally, we will evaluate the proportion of cases reported with a congenital anomaly in the hospital data but not in the EUROCAT registry data.

Description of data and data sources

Inclusion criteria for the study will be all live Births (birth type = 1) recorded in the EUROCAT registries and hospital cases with a congenital anomaly code included in the study for the birth years 2010-2014, with a diagnosis occurring in the first year of life. If there have been major changes in the coding of congenital anomalies in a certain time period, the year for inclusion will be set to include the new coding only. The ID of the child will be linked to the hospital database (including outpatient clinics). In order to have the full picture we will start the analysis with a summary table of all congenital anomaly codes in the hospital data, irrespective if the child is recorded in Eurocat or not. Since it is impossible to study all anomalies, we will focus on specific anomalies selected according to the criteria in Table 1.

Table 1. Congenital anomalies according to different criteria for inclusion, ICD code and EUROCAT subgroup

	ICD9	ICD10	EUROCAT Subgroup
Detectable at birth			
- **Gastroschisis**	75671	Q793	Al50
- **Cleft lip +/-cleft palate**	7491+2	Q36+Q37	Al102
- **Cleft palate**	7490	Q35	Al103
- **Clubfoot**	75450	Q660	Al66
- **Spina bifida**	741	Q05	Al6
High prenatal detection rate			
- **Unilateral renal agenesis**	753011*	Q600	No subgroup for unilateral
- **Hypoplastic left heart syndrome**	7467	Q234	Al30
- **Limb reduction defects**	7552-7554	Q71-Q73	Al62
Diagnosed after discharge from maternity unit			
- **Hirschsprung's disease**	75130-75133	Q431	Al45
- **Microcephaly**	7421	Q02	Al8
- **VSD**	7454	Q210	Al21

Grey zone between normal and abnormal			
- **Hydronephrosis**	75320	Q620	Al55
- **ASD**	7455	Q211	Al22
- **Hypospadias**	75260	Q54	Al59
Chromosomal anomaly			
- **Down syndrome**	7580	Q90	Al89
Mild anomaly			
- **Polydactyly**	7550	Q69	Al68

*extended code, not used in hospital databases

Variables to include

This study will use the defined WP4 common data model of children with congenital anomalies. EUROCAT variables for the study cases will be: type of birth (live birth), all ICD codes including syndrome variable, sex, length of gestation, survival beyond one week of age and when discovered. Variables from the hospital databases will be birth outcome (only live births) and gestational length of the pregnancy, ICD codes as reported in Table 1, and the number of ICD code fields.

Analysis

A detailed analysis plan will be written by UMCG with support from statisticians from SGUL (month 34, October 2019). Analysis will include all cases in subgroups reported in Table 1. In addition, power calculations will be performed by SGUL to avoid local tables with too many missing values due to small numbers occurring and restrictions on the reporting of small numbers.
Sensitivity and positive predictive value (PPV) will be used to assess the validity of the hospital data. Sensitivity measures the proportion of children correctly identified by hospital data as children with a congenital anomaly out of the total of all children within EUROCAT (gold standard). PPV is the proportion of children in hospital data correctly identified as having a congenital anomaly among all children who were identified as having an anomaly in hospital data. Finally, we will study the number of children in the hospital database who have an ICD9 (740-759) or ICD10 ("Q" chapter) code described in Table 1 code) to see whether they are reported in the congenital anomaly register.

Tables in the analysis plan will be developed to answer the following questions, for all registries together and by registry:

- Do all livebirths in the EUROCAT registry have a congenital anomaly code in the hospital database?
- Using the EUROCAT data as gold standard, how valid is the anomaly coding in the hospital database (codes within the same organ system)?
- What proportion of cases in the EUROCAT database have out-patient codes only in the hospital database (for each EUROlinkCAT subgroup)?
- What proportion of EUROCAT cases have unspecified codes only in the hospital database? (for specific subgroups such as CHD, hypospadias)
- What proportion of children with major congenital anomalies (ie are in EUROCAT) are classified as minor anomalies in the hospital database (according to the EUROCAT definition of minor) and are there national differences?
- What is the level of over-reporting/under-reporting of diagnosis and cases in the hospital databases compared to the EUROCAT registry?

Local analysis

UU and SGUL will produce common syntax scripts, which will conform to a common data model to ensure that all variables are standardised across all registries (month 36, December 2019). Registries will use syntax scripts provided to generate the tables/results outlined in the analysis plan. The WP4 common data model will be used for the study. The quality of the data linkage will be investigated and data quality checks will be conducted for unlikely results and outliers across registries (UU) and a report will be produced.

Data transmission to the Central Results Repository (CRR) and to WP6

The tables and results created by each registry using the supplied syntax scripts will be submitted in Excel, SPSS or STATA file formats, or other commercially available packages, to UU via the secure project portal (members' area on the EUROlinkCAT website) (month 38, February 2020). All data submitted will be aggregated - no individual case data will be sent to UU.

UU will then:

1. Import the tables from each participating registry to the CRR
2. Perform data quality checks on the maternal linkage
3. Generate extracts of data from the CRR required for this study

4. Send the relevant CRR extracts to the WP6 project leader (UMCG) via the secure project portal (members' area on the EUROlinkCAT website) (month 39, March 2020).

From March 2020 to autumn 2020, the pooled data will be analysed by UMCG. A meeting with all study partners will be held in autumn 2020 to agree on the conclusions of the study for the paper and on the recommendations given in the report to EU institutions.

Publication of results

The study will be published in a high-impact peer-review journal with open access and with authorship according to EUROlinkCAT criteria. Submission expected by month 51 (March 2021).

The results will also be included in Deliverable D8.3: "Report to EU institutions hosting health care databases with guidelines for improving the quality of the congenital anomaly coding" by month 57 (September 2021).

Overview of deadlines

Month 34 (October 2019): analysis plan

Month 36 (December 2019): syntax script to be send to registries

Month 38 (February 2020): tables/results submitted from local registries to UU

Month 39 (March 2020): tables send from UU to UMCG for analysis

Month 46 (October 2020): meeting for all partners in this study to discuss and agree on results

Month 49 (January 2021): submission of paper for publication

Month 57 (September 2021): submission and circulation to health authorities of report on guidelines for coding of congenital anomalies in health care databases.

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Appendix 2: List of tables for WP6 Livebirth study

List of tables for WP6 Livebirth study

Table	Name
1	Comparison of EUROlinkCAT livebirths with hospital diagnoses up to 1 year (≤365 days), all anomalies
2A	Comparison of EUROlinkCAT linked livebirths and hospital diagnosis (inpatient) , by subgroups (isolated and chromosomal anomalies)
2B	Comparison of EUROlinkCAT linked livebirths and hospital diagnosis (outpatient) , by subgroups (isolated and chromosomal anomalies)
2C	Comparison of EUROlinkCAT linked livebirths and hospital diagnosis (inpatient and outpatient) , by subgroups (isolated and chromosomal anomalies)
3A	Analysis of Inpatient hospital data, by subgroup
3B	Analysis of Outpatient hospital data, by subgroup
3C	Analysis of Inpatient and Outpatient hospital data , by subgroup
4	Analysis of unspecified codes (as the only code) in hospital data, during 1st year of life
5	Analysis of specificity of hospital diagnoses coding for EUROlinkCAT linked livebirths (selected anomalies)

Version

Date of running program

Data Signature Eurocat dataset

Data Signature Patient dataset

Data Signature Hospital admissions dataset

Data Signature Admission Diagnosis dataset

Data Signature Outpatient dataset

Data Signature Outpatient diagnosis dataset

Table	Name
1	Comparison of EUROlinkCAT livebirths with hospital diagnoses up to 1 year (≤365 days), all anomalies
2A	Comparison of EUROlinkCAT linked livebirths and hospital diagnosis (inpatient) , by subgroups (isolated and chromosomal anomalies)
2B	Comparison of EUROlinkCAT linked livebirths and hospital diagnosis (outpatient) , by subgroups (isolated and chromosomal anomalies)
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3B	Analysis of Outpatient hospital data, by subgroup
3C	Analysis of Inpatient and Outpatient hospital data , by subgroup
4	Analysis of unspecified codes (as the only code) in hospital data, during 1st year of life
5	Analysis of specificity of hospital diagnoses coding for EUROlinkCAT linked livebirths (selected anomalies)

	Exact ICD9	Exact ICD10	Appropriate ICD9*	Appropriate ICD10*	Minor ICD9	Minor ICD10	Unspecified ICD9	Unspecified ICD10
Used in Tables:	2,3A,3B,3C	2,3A,3B,3C	2,3A,3B,3C	2,3A,3B,3C	2	2	2	2
Anomaly subgroup								
Spina bifida (AI6)	741	Q05	740-742	Q00-Q07	75610 (756.17)	Q760	7599 (759.9)	Q899
Microcephaly (AI8)	7421 (742.1)	Q02	740-742	Q00-Q07	-	-	7599 (759.9)	Q899
VSD (AI21)	7454 (745.4)	Q210	745-747	Q20-Q28	-	-	7599 (759.9)	Q899
ASD (AI22)	7455 (745.5)	Q211	745-747	Q20-Q28	-	-	7599 (759.9)	Q899
Hypoplastic left heart syndrome (AI30)	7467 (746.7)	Q234	745-747	Q20-Q28	-	-	7599 (759.9)	Q899
Cleft lip+/-cleft palate (AI102)	7491, 7492 (749.1, 749.2)	Q36,Q37	749	Q35-Q37	-	-	7599 (759.9)	Q899
Cleft palate (AI103)	7490 (749.0)	Q35	749, excluding 74908 + (749.02)	Q35-Q37, excluding Q357	74908, (749.02), 75024**	Q357	7599 (759.9)	Q899
Cleft lip	7491 (749.1)	Q36						
Cleft lip and Cleft Palate	7492 (749.2)	Q37						
Hirschsprung's disease (AI45)	75130-75133 (751.3)	Q431	751	Q41-Q43	-	-	7599 (759.9)	Q899
Gastroschisis (AI50)	75671 (756.73)	Q793	7567 (756.7)	Q79	-	-	7599 (759.9)	Q899
Omphalocele (AI51)	75670 (756.72)	Q792	7567 (756.7)	Q79	-	-	7599 (759.9)	Q899
Unilateral renal agenesis (Aud4)	753011 (753.0)	Q600	753	Q60-Q64	-	-	7599 (759.9)	Q899
Hydronephrosis (AI55)	75320 (753.20)	Q620	753	Q62-Q64	-	-	7599 (759.9)	Q899
Hypospadias (AI59)	75260 (752.61)	Q54	752	Q54-Q56	-	-	7599 (759.9)	Q899
Limb reduction defects (AI62)	7552-7553 (755.2 - 755.3)	Q71-Q73	754-755, excluding 75451,75452, 75453,75460, 75461,75469, 75470,75471 (754.50, 754.52, 754.53,754.59, 754.60, 754.61, 754.62, 754.69, 754.71, 754.79)	Q65-Q74, excluding Q661-Q669	-	-	7599 (759.9)	Q899
Clubfoot (AI66)	75450 (754.51)	Q660	754-755, excluding 75451,75452, 75453,75460, 75461,75469, 75470,75471 (754.50, 754.52, 754.53,754.59, 754.60, 754.61, 754.62, 754.69, 754.71, 754.79)	Q65-Q74, excluding Q661-Q669	75451,75452, 75453,75460, 75461,75469, 75470,75471 (754.50, 754.52, 754.53,754.59, 754.60, 754.61, 754.62, 754.69, 754.71, 754.79)	Q661-Q669	7599 (759.9)	Q899
Polydactyly (AI68)	7550 (755.0)	Q69	754-755, excluding 75451,75452, 75453,75460, 75461,75469, 75470,75471 (754.50, 754.52, 754.53,754.59, 754.60, 754.61, 754.62, 754.69, 754.71, 754.79)	Q65-Q74, excluding Q661-Q669	-	-	7599 (759.9)	Q899
Down syndrome (AI89)	7580 (758.0)	Q90	758	Q90-Q93, Q96-Q99	-	-	7599 (759.9)	Q899

Note for Maria: it is very important for ICD9-CM to use the dot in the code.
* appropriate codes are defined such that they exclude minor/unspecified codes.
** no ICD9-CM code

FOR TABLE 4

	Unspec ICD9	Unspec ICD10	Minor ICD9	Minor ICD10	Appropriate ICD9*	Appropriate ICD10*
Used in Tables:	4	4	4	4	4	4
Congenital malformation unspecified	7599 (759.9)	Q899	74908, 75024, 75451,75452, 75453,75460, 75461,75469, 75470,75471,75610, (749.02, 754.50, 754.52, 754.53,754.59, 754.60, 754.61, 754.62, 754.69, 754.71, 754.79, 756.17)	Q357, Q661-Q669, Q760	740-759, excluding 74908, 75024, 75451,75452, 75453,75460, 75461,75469, 75470,75471, 75610, 7599 (749.02, 754.50, 754.52, 754.53,754.59, 754.60, 754.61, 754.62, 754.69, 754.71, 754.79, 756.17, 759.9)	Q00-Q99, excluding Q357, Q661-Q669, Q760, Q899
CA of nervous system unspec	74299 (742.9)	Q079	75610 (756.17)	Q760	740-742, excluding 74299 (742.9)	Q00-Q07, excluding Q079
CA of eye unspec	7439 (743.9)	Q159			743, excluding 7439 (743.9)	Q10-Q15, excluding Q159
CA of ear unspec	7443 (744.3)	Q179			7440-7442 (744.0 - 744.2)	Q16-Q17, excluding Q179
CA face and neck unspec	7449 (744.9)	Q189			7444-7448 (744.4-744.8)	Q18, excluding Q189
CA of heart, unspec	74699 (746.9)	Q249			745-746, excluding 74699 and (746.9)	Q20-Q27, excluding Q249
CA of circulatory system, unspec	7479 (747.9)	Q289			747, excluding 7479 (747.9)	Q28, excluding Q289
CA of digestive system, unspec	7519 (751.9)	Q459			751, excluding 7519 (751.9)	Q38-Q45, excluding Q459
CA of genitals, unspec	7529 (752.9)	Q529, Q559			752, excluding 7529 (752.9)	Q50-Q56, excluding Q529 and Q559
CA of urinary system, unspec	75399 (753.9)	Q649			753, excluding 75399 and (753.9)	Q60-Q64, excluding Q649
CA of limb, unspec	7559 (755.9)	Q749	75451,75452, 75453,75460, 75461,75469, 75470,75471 (754.50, 754.52, 754.53,754.59, 754.60, 754.61, 754.62, 754.69, 754.71, 754.79)	Q661-Q669	754-755, excluding 75451,75452, 75453,75460, 75461,75469, 75470,75471,7559 (754.50, 754.52, 754.53,754.59, 754.60, 754.61, 754.62, 754.69, 755.9)	Q65-Q74, excluding Q661-Q669, Q749
Chromosomal anomaly, unspec	75899 (758.9)	Q999			758, excluding 75899 and (758.9)	Q90-Q99, excluding Q999

* appropriate codes are defined such that they exclude minor/unspecified codes.

Names of BINARIES	EUROCAT CODES		HOSPITAL CODES			
	Exact	Appropriate (includes exact)	Exact	Appropriate (incl exact and excl minor/unspec)	Minor / Unspecified	
Used in Tables:	2,3A,3B,3C,5	2,3A,3B,3C	2,3A,3B,3C,5	2	2	*Roots - delete once fixed (remark of ML)*
ALL ANOMALIES						
Spina bifida (AI6)	AL6	AL6_A	L_AL6_E	L_AL6_A	L_AL6_M	AL6
Microcephaly (AI8)	AL8	AL8_A	L_AL8_E	L_AL8_A	L_AL8_M	AL8
VSD (AI21)	AL21	AL21_A	L_AL21_E	L_AL21_A	L_AL21_M	AL21
ASD (AI22)	AL22	AL22_A	L_AL22_E	L_AL22_A	L_AL22_M	AL22
Hypoplastic left heart syndrome (AI30)	AL30	AL30_A	L_AL30_E	L_AL30_A	L_AL30_M	AL30
Cleft lip+/-cleft palate (AI102)	AL102	AL102_A	L_AL102_E	L_AL102_A	L_AL102_M	AL102
Cleft palate (AI103)	AL103	AL103_A	L_AL103_E	L_AL103_A	L_AL103_M	AL103
Cleft lip			L_CL_E			LIPISOL
Cleft lip and Cleft Palate			L_CLCP_E			LIPANDPAL
Hirschsprung's disease (AI45)	AL45	AL45_A	L_AL45_E	L_AL45_A	L_AL45_M	AL45
Gastroschisis (AI50)	AL50	AL50_A	L_AL50_E	L_AL50_A	L_AL50_M	AL50
Omphalocele (AI51)	AL51	AL51_A	L_AL51_E	L_AL51_A	L_AL51_M	AL51
Unilateral renal agenesis (Aud4)	AUD4	AUD4_A	L_AUD4_E	L_AUD4_A	L_AUD4_M	AUD4
Hydronephrosis (AI55)	AL55	AL55_A	L_AL55_E	L_AL55_A	L_AL55_M	AL55
Hypospadias (AI59)	AL59	AL59_A	L_AL59_E	L_AL59_A	L_AL59_M	AL59
Limb reduction defects (AI62)	AL62	AL62_A	L_AL62_E	L_AL62_A	L_AL62_M	AL62
Clubfoot (AI66)	AL66	AL66_A	L_AL66_E	L_AL66_A	L_AL66_M	AL66
Polydactyly (AI68)	AL68	AL68_A	L_AL68_E	L_AL68_A	L_AL68_M	AL68
Down syndrome (AI89)	AL89	AL89_A	L_AL89_E	L_AL89_A	L_AL89_M	AL89

EUROCAT CODES **HOSPITAL CODES**

FOR TABLE 4

	Unspecified Code	Appropriate specified	Unspecified Code	
Congenital malformation unspecified	UNSPEC	AP_UNSPEC	L_UN_UNSPEC	
CA of nervous system unspec	UN_NS	AP_NS	L_UN_NS	NS
CA of eye unspec	UN_EYE	AP_EYE	L_UN_EYE	EYE
CA of ear unspec	UN_EAR	AP_EAR	L_UN_EAR	EAR
CA face and neck unspec	UN_FACE	AP_FACE	L_UN_FACE	FACE
CA of heart, unspec	UN_HEART	AP_HEART	L_UN_HEART	HEART
CA of circulatory system, unspec	UN_CIRCUL	AP_CIRCUL	L_UN_CIRCUL	CIRCUL
CA of digestive system, unspec	UN_DIGEST	AP_DIGEST	L_UN_DIGEST	DIGEST
CA of genitals, unspec	UN_GENITAL	AP_GENITAL	L_UN_GENITAL	GENITAL
CA of urinary system, unspec	UN_URIN	AP_URIN	L_UN_URIN	URIN
CA of limb, unspec	UN_LIMB	AP_LIMB	L_UN_LIMB	LIMB
Chromosomal anomaly, unspec	UN_CHROM	AP_CHROM	L_UN_CHROM	CHROM

Centre Number **Results last updated** **Script**

Table 1 **Comparison of EUROlinkCAT livebirths with hospital diagnoses up to 1 year (≤365 days), all anomalies**
Inpatient hospital data

		EUROlinkCAT Live Births diagnosed within 1st year				All hospital Live births with any major CA codes in 1st year
		Total livebirths	Linked live births		Not linked	
			Any major CA codes in hospital database	No CA codes		
Subgroup	**EUROCAT AL code**	**(a)+(b)+(c)**	**(a)**	**(b)**	**(c)**	
All anomalies	AL1					

Proportion of EUROlinkCAT livebirths linked to hospital records, by age at death

		Total livebirths	Linked live births		Not linked
			Any major CA codes in hospital database	No CA codes	
All anomalies	**AL1**	**(a)+(b)+(c)**	**(a)**	**(b)**	**(c)**
Age at death, days	0-6				
	7-27				
	28-90				
	91-364				
	survived >= 1 year				
	Not known				

Major CA codes - as defined by EUROCAT guide1.4, Section 3.3

Centre Number **Results last updated** **Script**

Table 2A **Comparison of EUROlinkCAT linked livebirths and hospital diagnosis (inpatient) , by subgroups (isolated and chromosomal anomalies)**
Diagnosis up to first year of life (≤365 days) **Inpatient hospital data**

			Linked livebirths								
Anomaly group	**Anomaly Isolated anomalies (mult_malf=ARNI) except for AL89**	**EUROCAT AL or AUD code**	**Total**	**Exact CA codes in hospital database†**		**Appropriate CA codes but not exact CA codes in hospital database†**		**Only minor codes or unspecified codes in hospital database†**		**Unrelated CA codes or no CA codes at all in hospital database**	
			(a)+(b)+(c)+(d)	(a)		(b)		(c)		(d)	
			N	n	%	n	%	n	%	n	%
Detectable at birth	Spina Bifida	AL6									
	Cleft lip with or without cleft palate	AL102									
	Cleft palate	AL103									
	Gastroschisis	AL50									
	Omphalocele	AL51									
	Club foot – talipes equinovarus	AL66									
Pre-natal detection	Hypoplastic left heart	AL30									
	Unilateral renal agenesis	AUD4									
	Limb reduction defects	AL62									
Late diagnosis	Severe microcephaly	AL8									
	VSD	AL21									
	Hirschsprung's disease	AL45									
Grey zone	ASD	AL22									
	Cong hydronephrosis	AL55									
	Hypospadias	AL59									
Chromosomal	Down syndrome	AL89									
Mild	Polydactyly	AL68									

† see Contents for the definition of exact, minor, unspecified and appropriate

Centre Number **Results last updated** **Script**

Table 2B **Comparison of EUROlinkCAT linked livebirths and hospital diagnosis (outpatient) , by subgroups (isolated and chromosomal anomalies)**
Diagnosis up to first year of life (≤365 days) **Outpatient hospital data**

			Linked livebirths								
Anomaly group	**Anomaly Isolated anomalies (mult_malf=ARNI) except for AL89**	**EUROCAT AL or AUD code**	**Total**	**Exact CA codes in hospital database†**		**Appropriate CA codes but not exact CA codes in hospital database†**		**Only minor codes or unspecified codes in hospital database†**		**Unrelated CA codes or no CA codes at all in hospital database**	
			(a)+(b)+(c)+(d)	(a)		(b)		(c)		(d)	
			N	n	%	n	%	n	%	n	%
Detectable at birth	Spina Bifida	AL6									
	Cleft lip with or without cleft palate	AL102									
	Cleft palate	AL103									
	Gastroschisis	AL50									
	Omphalocele	AL51									
	Club foot – talipes equinovarus	AL66									
Pre-natal detection	Hypoplastic left heart	AL30									
	Unilateral renal agenesis	AUD4									
	Limb reduction defects	AL62									
Late diagnosis	Severe microcephaly	AL8									
	VSD	AL21									
	Hirschsprung's disease	AL45									
Grey zone	ASD	AL22									
	Cong hydronephrosis	AL55									
	Hypospadias	AL59									
Chromosomal	Down syndrome	AL89									
Mild	Polydactyly	AL68									

† see Contents for the definition of exact, minor, unspecified and appropriate

Centre Number **Results last updated** **Script**

Table 2C **Comparison of EUROlinkCAT linked livebirths and hospital diagnosis (inpatient and outpatient) , by subgroups (isolated and chromosomal anomalies)**
Diagnosis up to first year of life (≤365 days) **Inpatient and Outpatient hospital data**

			Linked livebirths								
Anomaly group	**Anomaly Isolated anomalies (mult_malf=ARNI) except for AL89**	**EUROCAT AL or AUD code**	**Total**	**Exact CA codes in hospital database†**		**Appropriate CA codes but not exact CA codes in hospital database†**		**Only minor codes or unspecified codes in hospital database†**		**Unrelated CA codes or no CA codes at all in hospital database**	
			(a)+(b)+(c)+(d)	(a)		(b)		(c)		(d)	
			N	n	%	n	%	n	%	n	%
Detectable at birth	Spina Bifida	AL6									
	Cleft lip with or without cleft palate	AL102									
	Cleft palate	AL103									
	Gastroschisis	AL50									
	Omphalocele	AL51									
	Club foot – talipes equinovarus	AL66									
Pre-natal detection	Hypoplastic left heart	AL30									
	Unilateral renal agenesis	AUD4									
	Limb reduction defects	AL62									
Late diagnosis	Severe microcephaly	AL8									
	VSD	AL21									
	Hirschsprung's disease	AL45									
Grey zone	ASD	AL22									
	Cong hydronephrosis	AL55									
	Hypospadias	AL59									
Chromosomal	Down syndrome	AL89									
Mild	Polydactyly	AL68									

† see Contents for the definition of exact, minor, unspecified and appropriate

Centre Number **Results last updated** **Script**

Table 3A **Analysis of Inpatient hospital data, by subgroup**

Anomaly group	Anomaly (isolated anomalies except for al89)	ICD10-BPA	ICD9-BPA^	Hospital cases with any mention of specific code(s) in first year of life	Hospital cases not in EUROlinkCAT		Hospital cases in EUROlinkCAT with exact code*†		Hospital cases in EUROlinkCAT with appropriate CA codes but not exact code*†		Hospital cases in EUROlinkCAT with unrelated CA codes* for the anomaly in question		Comparison: Total livebirths in EUROCAT Linked & unlinked, isolated and multiples.
				(a)+(b)+(c)+(d)	(a)		(b)		(c)		(d)		
				N	n	%	n	%	n	%	n	%	n
Detectable at birth	Spina Bifida	Q05	741										
	Cleft lip with or without cleft palate	Q36, Q37	7491, 7492										
	Cleft palate	Q35	7490										
	Gastroschisis	Q793	75671 (756.73)										
	Omphalocele	Q792	75670 (756.72)										
	Club foot – talipes equinovarus	Q660	75450										
Prenatal detection	Hypoplastic left heart	Q234	7467										
	Unilateral renal agenesis	Q600	753011 (753.0)										
	Limb reduction defects	Q71-Q73	7552-7554										
Late diagnosis	Severe microcephaly	Q02	7421										
	VSD	Q210	7454										
	Hirschsprung's disease	Q431	(751.3)										
Grey zone	ASD	Q211	7455										
	Cong hydronephrosis	Q620	75320										
	Hypospadias	Q54	75260 (752.61)										
Chromosomal	Down syndrome	Q90	7580										
Mild	Polydactyly	Q69	7550										

** as found in EUROCAT malfo1-malfo8 and syndrome fields*

† see Contents for the definition of exact and appropriate

^ Numbers in brackets are to be considered equivalent when present in hospital databases using ICD9-CM coding systems.

Centre Number **Results last updated** **Script**

Table 3B **Analysis of Outpatient hospital data, by subgroup**

Anomaly group	Anomaly (isolated anomalies except for al89)	ICD10-BPA	ICD9-BPA^	Hospital cases with any mention of specific code(s) in first year of life	Hospital cases not in EUROlinkCAT		Hospital cases in EUROlinkCAT with exact code*†		Hospital cases in EUROlinkCAT with appropriate CA codes but not exact code*†		Hospital cases in EUROlinkCAT with unrelated CA codes* for the anomaly in question	
				(a)+(b)+(c)+(d)	(a)		(b)		(c)		(d)	
				N	n	%	n	%	n	%	n	%
Detectable at birth	Spina Bifida	Q05	741									
	Cleft lip with or without cleft palate	Q36, Q37	7491, 7492									
	Cleft palate	Q35	7490									
	Gastroschisis	Q793	75671 (756.73)									
	Omphalocele	Q792	75670 (756.72)									
	Club foot – talipes equinovarus	Q660	75450									
Prenatal detection	Hypoplastic left heart	Q234	7467									
	Unilateral renal agenesis	Q600	753011 (753.0)									
	Limb reduction defects	Q71-Q73	7552-7554									
Late diagnosis	Severe microcephaly	Q02	7421									
	VSD	Q210	7454									
	Hirschsprung's disease	Q431	(751.3)									
Grey zone	ASD	Q211	7455									
	Cong hydronephrosis	Q620	75320									
	Hypospadias	Q54	75260 (752.61)									
Chromosomal	Down syndrome	Q90	7580									
Mild	Polydactyly	Q69	7550									

** as found in EUROCAT malfo1-malfo8 and syndrome fields*

† see Contents for the definition of exact and appropriate

^ Numbers in brackets are to be considered equivalent when present in hospital databases using ICD9-CM coding systems.

Centre Number **Results last updated** **Script**

Table 3C **Analysis of Inpatient and Outpatient hospital data , by subgroup**

Anomaly group	Anomaly (isolated anomalies except for al89)	ICD10-BPA	ICD9-BPA^	Hospital cases with any mention of specific code(s) in first year of life	Hospital cases not in EUROlinkCAT		Hospital cases in EUROlinkCAT with exact code*†		Hospital cases in EUROlinkCAT with appropriate CA codes but not exact code*†		Hospital cases in EUROlinkCAT with unrelated CA codes* for the anomaly in question		Comparison: Total livebirths in EUROCAT Linked & unlinked, isolated and multiples.
				(a)+(b)+(c)+(d)	(a)		(b)		(c)		(d)		
				N	n	%	n	%	n	%	n	%	n
Detectable at birth	Spina Bifida	Q05	741										
	Cleft lip with or without cleft palate	Q36, Q37	7491, 7492										
	Cleft palate	Q35	7490										
	Gastroschisis	Q793	75671 (756.73)										
	Omphalocele	Q792	75670 (756.72)										
	Club foot – talipes equinovarus	Q660	75450										
Prenatal detection	Hypoplastic left heart	Q234	7467										
	Unilateral renal agenesis	Q600	753011 (753.0)										
	Limb reduction defects	Q71-Q73	7552-7554										
Late diagnosis	Severe microcephaly	Q02	7421										
	VSD	Q210	7454										
	Hirschsprung's disease	Q431	(751.3)										
Grey zone	ASD	Q211	7455										
	Cong hydronephrosis	Q620	75320										
	Hypospadias	Q54	75260 (752.61)										
Chromosomal	Down syndrome	Q90	7580										
Mild	Polydactyly	Q69	7550										

** as found in EUROCAT malfo1-malfo8 and syndrome fields*

† see Contents for the definition of exact and appropriate

^ Numbers in brackets are to be considered equivalent when present in hospital databases using ICD9-CM coding systems.

Centre Number **Results last updated** **Script**

Analysis of unspecified codes (as the only code) in hospital data, during 1st year of life **Inpatient hospital data**

Description organ groups (hospital data)	ICD10-BPA	ICD9-BPA^	Cases with unspecified code as only hospital anomaly code in first year of life	Cases not in EUROlinkCAT		Cases in EUROlinkCAT with same unspecified code as only code*		Cases in EUROlinkCAT with appropriate specified CA codes*†		Cases in EUROlinkCAT with unrelated CA codes only*	
			(a)+(b)+(c)+(d)	(a)		(b)		(c)		(d)	
			N	n	%	n	%	n	%	n	%
Congenital malformation, unspecified	Q899	7599 and 75999									
CA of nervous system unspec	Q079	74299 (742.9)									
CA of eye unspec	Q159	7439									
CA of ear, unspec	Q179	7443									
CA of face and neck, unspec	Q189	7449									
CA of heart, unspec	Q249	74699 (746.9)									
CA of circulatory system, unspec	Q289	7479									
CA of digestive system, unspec	Q459	7519									
CA of genitals, unspec	Q529; Q559	7529									
CA of urinary system, unspec	Q649	75399 (753.9)									
CA of limb, unspec	Q749	7559									
Chromosomal anomaly, unspec	Q999	75899 (758.9)									

** as found in EUROCAT malfo1-malfo8 and syndrome fields*

† *see Contents for definition of appropriate codes*

^Numbers in brackets are to be considered equivalent when present in hospital databases using ICD9-CM coding systems.

Centre Number **Results last updated** **Script**

Analysis of specificity of hospital diagnoses coding for EUROlinkCAT linked livebirths (selected anomalies) **Inpatient hospital data**

		Linked livebirths									
Anomaly (isolated anomalies)	**EUROCAT AL code**	**Total linked cases**	**Gastroschisis (75671, 756.73, Q793)**		**Omphalocele (75670, 756.72, Q792)**		**Gastroschisis and Omphalocele (75671,756.73,Q793) & (75670,756.72,Q792)**		**No exact codes for Gastroschisis or Omphalocele. i.e., appropriate CA codes* or no CA codes at all**	
		(a)+(b)+(c)+(d)	(a)		(b)		(c)		(d)	
		N	n	%	n	%	n	%	n	%
Gastroschisis	AL50									
Omphalocele	AL51									

		Linked livebirths											
Subgroup (isolated anomalies)	**EUROCAT AL code**	**Total linked cases**	**Cleft Palate (7490, Q35)**		**Cleft lip (7491, Q36)**		**Cleft lip and cleft palate (7492,Q37)**		**More than one of Q35,Q36, Q37 or 7490,7491 & 7492**		**No exact codes for Cleft Palate or Cleft lip. i.e., appropriate CA codes* or no CA codes at all**	
		(a)+(b)+(c)+(d)+(e)	(a)		(b)		(c)		(d)		(e)	
		N	n	%	n	%	n	%	n	%	n	%
Cleft lip with or without cleft palate	AL102											
Cleft palate	AL103											

** see Contents for definition of appropriate codes*

Appendix 3: Live Births Common Data Model

Establishing a linked European Cohort of Children with Congenital Anomalies

EUROlinkCAT Common Data Model: Accuracy in Coding of Livebirth

Congenital Anomaly cases

[Version: 6th July 2021]

Authors: EUROlinkCAT WP2

WP2 team: Dr Maria Loane (lead), Dr James Densem, Dr Joanne Given, Elizabeth Limb, Prof Joan Morris, Dr Joachim Tan
Standardisation Committee: Dr M Loane (lead), Dr J Densem, Dr H de Walle, Dr E Garne, Prof JK Morris, Dr A Pierini, Prof J Rankin, Dr A Rissmann

Website: http://www.EUROlinkCAT.eu

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Introduction

Seven EUROCAT congenital anomaly registries in six European countries participated in the EUROlinkCAT study assessing accuracy of coding congenital anomalies in livebirth children up to their first birthday (≤ 365 days). The study aimed to evaluate the **accuracy** and **quality** of the International Classification of Disease (ICD) codes recorded in a registry's health care databases by comparing these to the ICD codes recorded in the registry's EUROCAT congenital anomaly database. EUROlinkCAT has developed a common data model (CDM) to standardise data for this study.

The CDM for coding accuracy in livebirth children with congenital anomalies consists of six tables as presented in the Table Overview i.e. there is a separate table for each of the following: EUROCAT congenital anomaly livebirth cases (these data are already standardised[1]), patient data, hospital admissions, diagnoses, outpatient visits and outpatient diagnoses. The child's unique identification number (ID) or a unique ID generated by the syntax script link all tables, as shown in Figure 1. Thus, irrespective of the structure of the original source data in each registry, the standardisation process creates a standardised dataset that provides the same structure and the same standardised variables across all participating registries. This ensures that data included in the EUROlinkCAT studies are comparable across registries thus facilitating distributed analysis. Not all participating registries will be able to provide values for all variables listed in the following pages, but this will be reflected in each table's missing frequency data.

[1] EUROCAT (2013). EUROCAT Guide 1.4: Instruction for the registration of congenital anomalies. EUROCAT Central Registry, University of Ulster

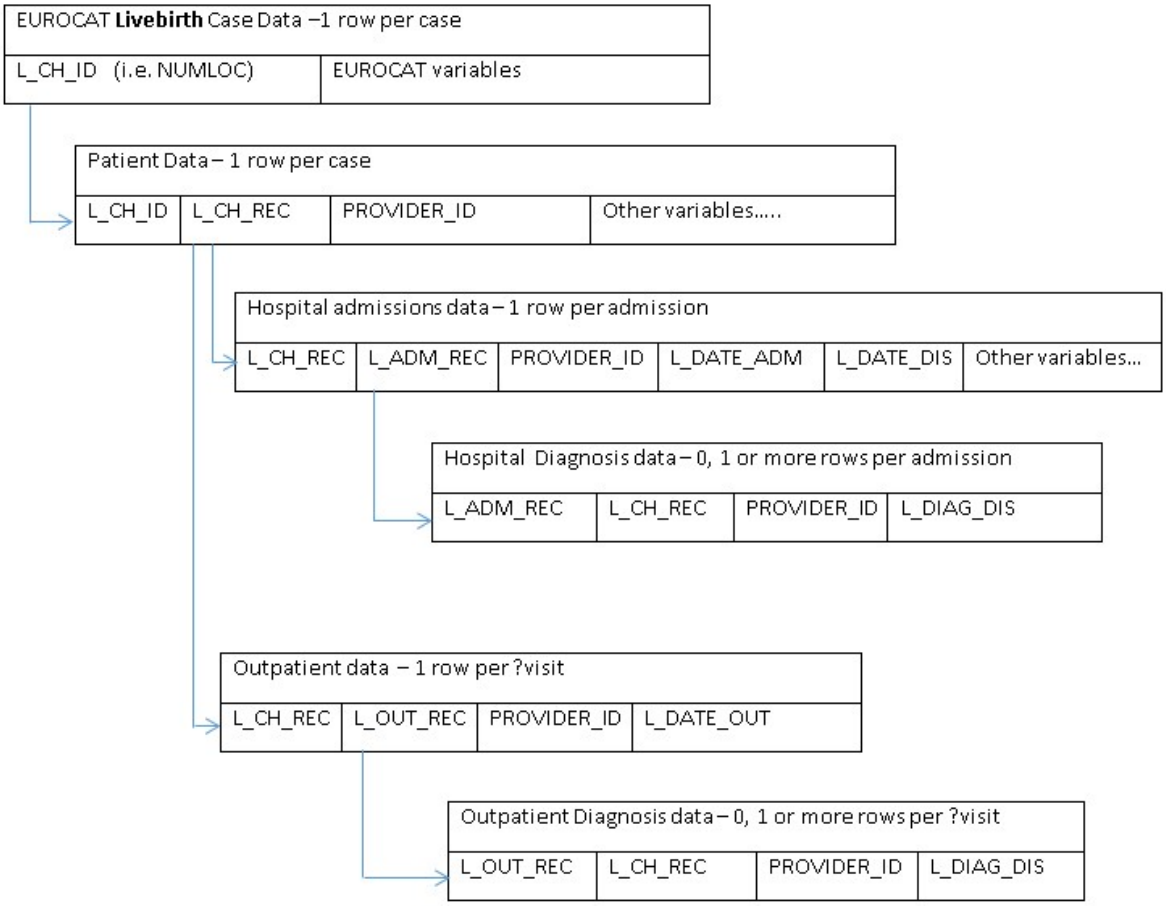
Table Overview

Table	Description
EUROCAT LB case data	There will be one row for each LB case. Data is sourced from the EUROCAT file [file name: "XX_CA_cases_1995-2014v2] where XX is the EUROCAT Registry number.
Patient	There will be one row for each LB case in this table. It will contain variables for which there is only one value per case or control (i.e. gender). The data will be sourced from the child's hospital medical records and the child's outpatient records.
Hospital Admission	This table holds data relating to hospital admissions. There will be a row for each identifiable hospital admission, therefore each patient row may have zero, one or more hospital admission rows related to it. Hospital stays relating to obstetric care, accident & emergency, and emergency room stays are excluded.
Diagnosis	This table holds information on diagnoses. There will be one row per diagnosis code and all diagnosis rows will be related to their specific hospital admission row. Each hospital admission may have zero, one or more diagnosis rows associated with it.
Outpatients	This table holds data relating to outpatient visits. There will be a row for each identifiable outpatient visit, therefore each patient row may have zero, one or more outpatient visits rows related to it.
OP_Diagnosis	This table holds information on diagnoses made at the outpatient clinic. There will be one row per diagnosis code and all diagnosis rows will be related to their specific outpatient visit row. Each outpatient visit may have zero, one or more diagnosis rows associated with it.

A visual representation of the table structure is presented below in Figure 1

Figure 1 LB study table structure

Livebirth Study



Data Dictionary by Table

Variable name	*Variable definition/ description*	*Variable format*	*Variable values*	*Tables*[2]
Table: EUROCAT case data - Livebirths (LB) ***One row for each LB***				
L_CH_ID	EUROCAT unique ID number (NUMLOC) to identify LB in EUROCAT file [file name: "XX_CA_cases_1995-2014v2].	As recorded in EUROCAT case file		- EUROCAT LB
EUROCAT binary subgroups (exact codes)				
AL1	All major Congenital Anomalies only Minor anomalies are excluded, see Appendix for list ICD9: 740-759 ICD10: Q chapter	Binary	0 = No 1 = Yes	- EUROCAT LB
AL6	Spina Bifida (exact code) ICD9: 741 ICD10: Q05	Binary	0 = No 1 = Yes	- EUROCAT LB
AL8	Severe microcephaly (exact code) ICD9: 7421 ICD10: Q02	Binary	0 = No 1 = Yes	- EUROCAT LB
AL21	VSD (exact code) ICD9: 7454 ICD10: Q210	Binary	0 = No 1 = Yes	- EUROCAT LB
AL22	ASD (exact code) ICD9: 7455 ICD10: Q211	Binary	0 = No 1 = Yes	- EUROCAT LB
AL30	Hypoplastic left heart (exact code) ICD9: 7467 ICD10: Q234	Binary	0 = No 1 = Yes	- EUROCAT LB
AL102	Cleft lip with or without cleft palate (exact code) ICD9: 7491, 7492 ICD10: Q36, Q37	Binary	0 = No 1 = Yes	- EUROCAT LB
AL103	Cleft palate (exact code) ICD9: 7490 ICD10: Q35	Binary	0 = No 1 = Yes	- EUROCAT LB
AL45	Hirschsprung's disease (exact code) ICD9: 75130-75133 ICD10: Q431	Binary	0 = No 1 = Yes	- EUROCAT LB
AL50	Gastroschisis (exact code) ICD9: 75671 ICD10: Q793	Binary	0 = No 1 = Yes	- EUROCAT LB

[2] Please see Figure 1 for data table structure

Variable name	*Variable definition/ description*	*Variable format*	*Variable values*	*Tables[2]*
AL51	Omphalocele (exact code) ICD9: 75670 ICD10: Q792	Binary	0 = No 1 = Yes	- EUROCAT LB
AUD4	Unilateral renal agenesis (exact code) ICD9: 75301 ICD10: Q600	Binary	0 = No 1 = Yes	- EUROCAT LB
AL55	Congenital hydronephrosis (exact code) ICD9: 75320 ICD10: Q620	Binary	0 = No 1 = Yes	- EUROCAT LB
AL59	Hypospadias (exact code) ICD9: 75260 ICD10: Q54	Binary	0 = No 1 = Yes	- EUROCAT LB
AL62	Limb reduction defects (exact code) ICD9: 7552-7553 ICD10: Q71-Q73	Binary	0 = No 1 = Yes	- EUROCAT LB
AL66	Club foot – talipes equinovarus (exact code) ICD9: 75450 ICD10: Q660	Binary	0 = No 1 = Yes	- EUROCAT LB
AL68	Polydactyly (exact code) ICD9: 7550 ICD10: Q69	Binary	0 = No 1 = Yes	- EUROCAT LB
AL89	Down syndrome (exact code) ICD9: 7580 ICD10: Q90	Binary	0 = No 1 = Yes	- EUROCAT LB
EUROCAT binary subgroups (appropriate codes)				
AL6_A	Spina Bifida (appropriate code) ICD9: 740-742 ICD10: Q00-Q07	Binary	0 = No 1 = Yes	- EUROCAT LB
AL8_A	Severe microcephaly (appropriate code) ICD9: 740-742 ICD10: Q00-Q07	Binary	0 = No 1 = Yes	- EUROCAT LB
AL21_A	VSD (appropriate code) ICD9: 745-747 ICD10: Q20-Q28	Binary	0 = No 1 = Yes	- EUROCAT LB
AL22_A	ASD (appropriate code) ICD9: 745-747 ICD10: Q20-Q28	Binary	0 = No 1 = Yes	- EUROCAT LB
AL30_A	Hypoplastic left heart (appropriate code) ICD9: 745-747 ICD10: Q20-Q28	Binary	0 = No 1 = Yes	- EUROCAT LB
AL102_A	Cleft lip with or without cleft palate (appropriate code) ICD9: 749 ICD10: Q35-Q37	Binary	0 = No 1 = Yes	- EUROCAT LB

Variable name	*Variable definition/ description*	*Variable format*	*Variable values*	*Tables[2]*
AL103_A	Cleft palate (appropriate code) ICD9: 749 (excluding 74908) ICD10: Q35-Q37 (excluding Q357)	Binary	0 = No 1 = Yes	- EUROCAT LB
AL45_A	Hirschsprung's disease (appropriate code) ICD9: 751 ICD10: Q41-Q43	Binary	0 = No 1 = Yes	- EUROCAT LB
AL50_A	Gastroschisis (appropriate code) ICD9: 7567 ICD10: Q79	Binary	0 = No 1 = Yes	- EUROCAT LB
AL51_A	Omphalocele (appropriate code) ICD9: 7567 ICD10: Q79	Binary	0 = No 1 = Yes	- EUROCAT LB
AUD4_A	Unilateral renal agenesis (appropriate code) ICD9: 753 ICD10: Q60-Q64	Binary	0 = No 1 = Yes	- EUROCAT LB
AL55_A	Congenital hydronephrosis (appropriate code) ICD9: 753 ICD10: Q62-Q64	Binary	0 = No 1 = Yes	- EUROCAT LB
AL59_A	Hypospadias (appropriate code) ICD9: 752 ICD10: Q54-Q56	Binary	0 = No 1 = Yes	- EUROCAT LB
AL62_A	Limb reduction defects (appropriate code) ICD9: 754-755 (excluding 75451, 75452, 75453, 75460, 75461, 75469, 75470, 75471) ICD10: Q65-Q74 (excluding Q661, Q662, Q663, Q664, Q665, Q666, Q667, Q668, Q669)	Binary	0 = No 1 = Yes	- EUROCAT LB
AL66_A	Club foot – talipes equinovarus (appropriate code) ICD9: 754-755 (excluding 75451, 75452, 75453, 75460, 75461, 75469, 75470, 75471) ICD10: Q65-Q74 (excluding Q661, Q662, Q663, Q664, Q665, Q666, Q667, Q668, Q669)	Binary	0 = No 1 = Yes	- EUROCAT LB
AL68_A	Polydactyly (appropriate code) ICD9: 754-755 (excluding 75451, 75452, 75453, 75460, 75461, 75469, 75470, 75471) ICD10: Q65-Q74 (excluding Q661, Q662, Q663, Q664, Q665, Q666, Q667, Q668, Q669)	Binary	0 = No 1 = Yes	- EUROCAT LB

Variable name	*Variable definition/ description*	*Variable format*	*Variable values*	*Tables[2]*
AL89_A	Down syndrome (appropriate code) ICD9: 758 ICD10: Q90-Q93, Q96-Q99	Binary	0 = No 1 = Yes	- EUROCAT LB
EUROCAT binary organ subgroups (appropriate codes)				
AP_UNSPEC	Congenital anomalies (appropriate code) ICD9: 740-759, excluding 74908, 75024, 75451, 75452, 75453, 75460, 75461, 75469, 75470, 75471, 75610, and 7599 ICD10: Q00-Q99, excluding Q357, Q661, Q662, Q663, Q664, Q665, Q666, Q667, Q668, Q669, Q760, and Q899	Binary	0 = No 1 = Yes	- EUROCAT LB
AP_NS	CA of nervous system (appropriate code) ICD9: 740-742, excluding 74299 ICD10: Q00-Q07 excluding Q079	Binary	0 = No 1 = Yes	- EUROCAT LB
AP_EYE	CA of eye (appropriate code) ICD9: 743, excluding 7439 ICD10: Q10-Q15, excluding Q159	Binary	0 = No 1 = Yes	- EUROCAT LB
AP_EAR	CA of ear (appropriate code) ICD9: 7440-7442 ICD10: Q16-Q17, excluding Q179	Binary	0 = No 1 = Yes	- EUROCAT LB
AP_FACE	CA face and neck (appropriate code) ICD9: 7444-7448 ICD10: Q18, excluding Q189	Binary	0 = No 1 = Yes	- EUROCAT LB
AP_HEART	CA of heart, (appropriate code) ICD9: 745-746, excluding 74699 ICD10: Q20-Q27 excluding Q249	Binary	0 = No 1 = Yes	- EUROCAT LB
AP_CIRCUL	CA of circulatory system, (appropriate code) ICD9: 747, excluding 7479 ICD10: Q28, excluding Q289	Binary	0 = No 1 = Yes	- EUROCAT LB
AP_DIGEST	CA of digestive system, (appropriate code) ICD9: 751, excluding 7519 ICD10: Q38-Q45, excluding Q459	Binary	0 = No 1 = Yes	- EUROCAT LB
AP_GENITAL	CA of genitals, (appropriate code) ICD9: 752, excluding 7529 ICD10: Q50-Q56, excluding Q529 and Q559	Binary	0 = No 1 = Yes	- EUROCAT LB
AP_URIN	CA of urinary system, (appropriate code) ICD9: 753, excluding 75399 ICD10: Q60-Q64, excluding Q649	Binary	0 = No 1 = Yes	- EUROCAT LB
AP_LIMB	CA of limb, (appropriate code) ICD9: 754-755 (excluding 75451, 75452, 75453, 75460, 75461, 75469, 75470, 75471, 7559)	Binary	0 = No 1 = Yes	- EUROCAT LB

Variable name	*Variable definition/ description*	*Variable format*	*Variable values*	*Tables[2]*
	ICD10: Q65-Q74 (excluding Q661, Q662, Q663, Q664, Q665, Q666, Q667, Q668, Q669, Q749)			
AP_CHROM	Chromosomal anomaly, (appropriate code) ICD9: 758, excluding 75899 ICD10: Q90-Q99, excluding Q999	Binary	0 = No 1 = Yes	- EUROCAT LB
EUROCAT binary organ subgroups (unspecified codes)				
UN_UNSPEC	Congenital anomalies (minor and unspecified codes) ICD9: 74908, 75024, 75451, 75452, 75453, 75460, 75461, 75469, 75470, 75471, 75610, and 7599 ICD10: Q357, Q661, Q662, Q663, Q664, Q665, Q666, Q667, Q668, Q669, Q760, and Q899	Binary	0 = No 1 = Yes	- EUROCAT LB
UN_NS	CA of nervous system minor/unspecified ICD9: 75610, 74299 ICD10: Q760, Q079	Binary	0 = No 1 = Yes	- EUROCAT LB
UN_EYE	CA of eye unspecified ICD9: 7439 ICD10: Q159	Binary	0 = No 1 = Yes	- EUROCAT LB
UN_EAR	CA of ear unspecified ICD9: 7443 ICD10: Q179	Binary	0 = No 1 = Yes	- EUROCAT LB
UN_FACE	CA face and neck unspecified ICD9: 7449 ICD10: Q189	Binary	0 = No 1 = Yes	- EUROCAT LB
UN_HEART	CA of heart, unspecified ICD9: 74699 ICD10: Q249	Binary	0 = No 1 = Yes	- EUROCAT LB
UN_CIRCUL	CA of circulatory system, unspecified ICD9: 7479 ICD10: Q289	Binary	0 = No 1 = Yes	- EUROCAT LB
UN_DIGEST	CA of digestive system, unspecified ICD9: 7519 ICD10: Q459	Binary	0 = No 1 = Yes	- EUROCAT LB
UN_GENITAL	CA of genitals, unspecified ICD9: 7529 ICD10: Q529 and Q559	Binary	0 = No 1 = Yes	- EUROCAT LB
UN_URIN	CA of urinary system, unspecified ICD9: 75399 ICD10: Q649	Binary	0 = No 1 = Yes	- EUROCAT LB

Variable name	***Variable definition/ description***	***Variable format***	***Variable values***	***Tables[2]***
UN_LIMB	CA of limb, minor/unspecified ICD9: 75451, 75452, 75453, 75460, 75461, 75469, 75470, 75471, 7559 ICD10: Q661, Q662, Q663, Q664, Q665, Q666, Q667, Q668, Q669, Q749	Binary	0 = No 1 = Yes	- EUROCAT LB
UN_CHROM	Chromosomal anomaly, unspecified ICD9: 75899 ICD10: Q999	Binary	0 = No 1 = Yes	- EUROCAT LB
Table: Patient level data ***<u>One row per child</u>*** ***Core variables for linkage to hospital discharge records and for calculating age at event***				
L_CH_ID	Unique identifier of child A unique ID that links child to another database	As recorded locally		- Patient - EUROCAT case data
L_CH_REC	Unique child record number Used to link patient, admission, diagnoses, outpatient (OP) visits, and OP diagnoses Generated by syntax script	Numeric		- Patient - Hospital admission - Diagnosis - OP visit - OP Diagnosis
PROVIDER_ID	Unique reference number as present in the provider's linked data	As recorded locally		- Patient - Hospital admission - Diagnosis - OP visit - OP Diagnosis
L_CASECON	Case or control status (apply status AFTER linkage is complete) Exclusions: - child with gestational age <23 weeks Control with ICD10 Q code or ICD9 (-CM) 740-759 codes recorded. This is a child with a congenital anomaly code (ICD10 Q code, or ICD9-CM 740-759) in hospital discharge records that is not recorded as a EUROCAT case Children coded as 1 or 3 will be included in WP6 LB analysis.	Numeric	1= Case 2= Control with no ICD10 Q code or ICD9(-CM) 740-759 codes recorded 3=Control with ICD10 Q code or ICD9(-CM) 740-759 codes recorded	- Patient - Hospital admission - Diagnosis - OP visit - OP Diagnosis
L_CH_DATE_B	Child's date of birth	DDMonYYYY		- Patient
L_CH_YEAR_B	Child's year of birth	YYYY		- Patient
L_CH_DATE_D	Child's date of death	DDMonYYYY		- Patient
L_CH_YEAR_D	Child's year of death	YYYY		- Patient
L_CH_AGED_gp	Grouped age at death in <u>complete days</u> (up to 1st birthday).	Numeric (1 digit)	1 = died 0-6 days after birth 2 = died 7-27 days after birth 3 = died 28-90 days after	- Patient

Variable name	*Variable definition/ description*	*Variable format*	*Variable values*	*Tables[2]*
	A calculated field using the difference between date of death and death of birth i.e. subtract child's date of birth from child's date of death. The value 9 includes unknown age of death, unknown if child died or survived (e.g. child lost to follow-up)		birth 4 = died 91-364 days after birth 5 = survived ≥ 1 year 9 = Not known	
L_CH_GA_B	Child's gestational age at birth (in completed weeks).	Numeric	99 = Not known . = Not recorded or not available for study	- Patient
L_WP6HOSPADM	Admitted to hospital (up to 1st birthday, ≤ 365 days) Exclude Obstetric care, Accident & Emergency/ Emergency room stays	Binary	0= No hospital admissions 1= One or more hospital admission (s)	- Patient
L_OUT	Attended outpatient clinic (up to 1st birthday, ≤ 365 days)	Binary	0= No outpatient visit 1= One or more outpatient visit (s)	- Patient
Recoded variables				
GA_WP4_gp	Grouped Gestational age GA <23 weeks, excluded from study GA >44 weeks, code as unknown Blank or missing, code as unknown	Numeric	1 = 23-27weeks 2 = 28-31 weeks 3= 32-36 weeks 4 = 37+ weeks 9 = unknown	-Patient
Matage_gp	Grouped Maternal age at TOPFA Maternal age range 10-19 years, code =1 20-34 years, code=2 35-59 years, code=3 All other values, blanks or missing, code=9	Numeric	1= <20 years 2= 20-34 years 3= 35+ years 9=Not known	-Patient
Derived variables relating to linkage				
L_MATCH_TYPE_H	Match with hospital database The value 4 "Only matched to hospital discharge database outside the study period or matched to hospital outpatient records in the study period" is included for matching purposes only i.e. the hospital stay for this child is not included in analysis. The rationale is that if a child is not matched to hospital discharge records during the study period, but is found in hospital records AFTER the study period, then we can be more confident that the child did not have a hospital admission during our study period. Similarly, if a child is found in outpatient records during the study period but is not found in the hospital discharge records, we can be more confident that the child did not have a hospital admission during our study period.	Numeric	1 = Linkage to hospital database - match 2 = Linkage to hospital database - non-match 3 = EUROCAT death only 4 = Only matched to hospital discharge database outside the study period or matched to hospital outpatient records in the study period	-Patient

Variable name	***Variable definition/ description***	***Variable format***	***Variable values***	***Tables[2]***
L_CONFID_HDR	Strength of match with hospital database. Use local data provider's codes for assessing confidence that the case is correctly matched. If local code unavailable, use suggested coding	Numeric	0=Found in other database 1=Excellent 2=Good 3=Fair 4=Poor 9=Not Matched	- Patient
Table: Hospital admission variables ***(excluding Obstetric stays, Accident & Emergency/ Emergency room stays)*** ***One row for each hospital admission.*** ***If multiple hospital admissions, please complete all hospital admission variables for each admission***				
L_CH_REC	Unique child record number Used to link patient, admission, diagnoses, outpatient (OP) visits, and OP diagnoses Generated by syntax script	Numeric		- Patient - Hospital admission - Diagnosis - OP visit - OP Diagnosis
PROVIDER_ID	Unique reference number as present in the provider's linked data	As recorded locally		- Patient - Hospital admission - Diagnosis - OP visit - OP Diagnosis
L_ADM_REC	Unique admission record number Used to link the child's admission records to the child's diagnoses and procedures & surgeries during that admission Generated by syntax script	Numeric		- Hospital admission - Diagnosis
L_CASECON	Case or control status (apply status AFTER linkage is complete) Exclusions: - child with gestational age <23 weeks Control with ICD10 Q code or ICD9 (-CM) 740-759 codes recorded. This is a child with a congenital anomaly code (ICD10 Q code, or ICD9-CM 740-759) in hospital discharge records that is not recorded as a EUROCAT case Children coded as 1 or 3 will be included in WP6 LB analysis.	Numeric	1= Case 2= Control with no ICD10 Q code or ICD9(-CM) 740-759 codes recorded 3=Control with ICD10 Q code or ICD9(-CM) 740-759 codes recorded	- Patient - Hospital admission - Diagnosis - OP visit - OP Diagnosis
L_DATE_ADM	Date of admission to hospital	DDMonYYYY		- Hospital admission
L_YEAR_ADM	Year of admission to hospital	YYYY		- Hospital admission
L_DATE_DIS	Date of discharge from hospital	DDMonYYYY		- Hospital admission
L_YEAR_DIS	Year of discharge from hospital	YYYY		- Hospital admission
L_AGEADM	Child's age at hospital admission in days	Numeric	0= <1 day old	- Hospital

Variable name	***Variable definition/ description***	***Variable format***	***Variable values***	***Tables[2]***
	(up to 1st birthday, ≤ 365 days). Subtract child's date of birth from date of admission to hospital		1= 1 day old 2= 2 days old etc 999= exact age not known	admission
Table: Diagnosis variables ***up to 1st birthday*** ***(Inpatient stay)*** ***Each diagnosis is a separate observation (row) in the table*** ***0, 1 or more rows for each hospital admission*** ***If multiple diagnoses, please provide date of each diagnosis***				
L_CH_REC	Unique child record number Used to link patient, admission, diagnoses, outpatient (OP) visits, and OP diagnoses Generated by syntax script	Numeric		- Patient - Hospital admission - Diagnosis - OP visit - OP Diagnosis
PROVIDER_ID	Unique reference number as present in the provider's linked data	As recorded locally		- Patient - Hospital admission - Diagnosis - OP visit - OP Diagnosis
L_ADM_REC	Unique admission record number Used to link the child's admission records to the child's diagnoses and procedures during that admission Generated by syntax script	Numeric		- Hospital admission - Diagnosis
L_CASECON	Case or control status (apply status AFTER linkage is complete) Exclusions: - child with gestational age <23 weeks Control with ICD10 Q code or ICD9 (-CM) 740-759 codes recorded. This is a child with a congenital anomaly code (ICD10 Q code, or ICD9-CM 740-759) in hospital discharge records that is not recorded as a EUROCAT case Children coded as 1 or 3 will be included in WP6 LB analysis.	Numeric	1= Case 2= Control with no ICD10 Q code or ICD9(-CM) 740-759 codes recorded 3=Control with ICD10 Q code or ICD9(-CM) 740-759 codes recorded	- Patient - Hospital admission - Diagnosis - OP visit - OP Diagnosis
L_DIAG_DIS	Diagnosis in ICD9 or ICD10 for the hospital stay	String As recorded in the hospital database		- Diagnosis
Table: Outpatients ***One row for each outpatient visit.***				

Variable name	***Variable definition/ description***	***Variable format***	***Variable values***	***Tables[2]***
If multiple outpatient visits, please complete all variables for each outpatient visit				
L_CH_REC	Unique child record number Used to link patient, admission, diagnoses, outpatient (OP) visits, and OP diagnoses Generated by syntax script	Numeric		- Patient - Hospital admission - Diagnosis - OP visit - OP Diagnosis
PROVIDER_ID	Unique reference number as present in the provider's linked data	As recorded locally		- Patient - Hospital admission - Diagnosis - OP visit - OP Diagnosis
L_C_OUT_REC	Unique child outpatients record number Used to link outpatient diagnoses and procedures & surgeries during that visit Generated by syntax script	Numeric		- OP visit - OP Diagnosis
L_CASECON	Case or control status (apply status AFTER linkage is complete) Exclusions: - child with gestational age <23 weeks Control with ICD10 Q code or ICD9 (-CM) 740-759 codes recorded. This is a child with a congenital anomaly code (ICD10 Q code, or ICD9-CM 740-759) in hospital discharge records that is not recorded as a EUROCAT case Children coded as 1 or 3 will be included in WP6 LB analysis.	Numeric	1= Case 2= Control with no ICD10 Q code or ICD9(-CM) 740-759 codes recorded 3=Control with ICD10 Q code or ICD9(-CM) 740-759 codes recorded	- Patient - Hospital admission - Diagnosis - OP visit - OP Diagnosis
L_C_DATE_OUT	Date of child's outpatient visit	DDMonYYYY		- OP visit
L_C_YEAR_OUT	Year of child's outpatient visit	YYYY		- OP visit
L_C_AGEOUT	Child's age at outpatient visit <u>in days</u> (up to 1st birthday, ≤ 365 days). Subtract child's date of birth from date of admission to hospital	Numeric	0= <1 day old 1= 1 day old 2= 2 days old etc 999= exact age not known	- OP visit
Table: Diagnosis at Outpatient visit variables ***Each diagnosis is a separate observation (row) in the table*** ***<u>0, 1 or more rows for each outpatient visit</u>*** ***If multiple diagnoses, please provide date of each diagnosis***				
L_CH_REC	Unique child record number Used to link patient, admission, diagnoses, outpatient (OP) visits, and OP diagnoses Generated by syntax script	Numeric		- Patient - Hospital admission - Diagnosis - OP visit - OP Diagnosis
PROVIDER_ID	Unique reference number as present in the provider's linked data	As recorded locally		- Patient - Hospital

Variable name	*Variable definition/ description*	*Variable format*	*Variable values*	*Tables[2]*
				admission - Diagnosis - OP visit - OP Diagnosis
L_C_OUT_REC	Unique child outpatients record number Used to link outpatient diagnoses and procedures & surgeries during that visit Generated by syntax script	Numeric		- OP visit - OP Diagnosis
L_CASECON	Case or control status (apply status AFTER linkage is complete) Exclusions: - child with gestational age <23 weeks Control with ICD10 Q code or ICD9 (-CM) 740-759 codes recorded. This is a child with a congenital anomaly code (ICD10 Q code, or ICD9-CM 740-759) in hospital discharge records that is not recorded as a EUROCAT case Children coded as 1 or 3 will be included in WP6 LB analysis.	Numeric	1= Case 2= Control with no ICD10 Q code or ICD9(-CM) 740-759 codes recorded 3=Control with ICD10 Q code or ICD9(-CM) 740-759 codes recorded	- Patient - Hospital admission - Diagnosis - OP visit - OP Diagnosis
L_C_OUT_DIAG	Diagnosis in ICD9 or ICD10 at the outpatient clinic	String As recorded in the outpatient database		- OP Diagnosis
Congenital Anomalies recorded in Hospital data ***Separate binary variables for:*** • ***exact codes for the CAs found in health care databases*** • ***appropriate codes for the CAs found in health care databases*** • ***minor / unspecified codes for the CAs found in health care databases*** ***The exact, appropriate and minor/ unspecified binary variables listed below are created in <u>both</u> the Diagnosis table and in the Outpatient Diagnosis table*** *Codes in brackets are ICD9-CM.*				
Hospital data – exact codes				
L_AL1	All major Congenital Anomalies only ICD9-CM: (740-759.9 excluding 749.02, 754.50, 754.52, 754.53, 754.59, 754.60, 754.61, 754.62, 754.69, 754.71, 754.79 and 756.17) ICD10: Q chapter excluding Q357, Q661, Q662, Q663, Q664, Q665, Q666, Q667, Q668, Q669, Q760	Binary	0 = No 1 = Yes	- Diagnosis - OP Diagnosis
L_AL6_E	Spina Bifida (exact code) ICD9-CM: (741) ICD10: Q05	Binary	0 = No 1 = Yes	- Diagnosis - OP Diagnosis
L_AL8_E	Severe microcephaly (exact code)	Binary	0 = No 1 = Yes	- Diagnosis - OP Diagnosis

Variable name	*Variable definition/ description*	*Variable format*	*Variable values*	*Tables[2]*
	ICD9-CM: (742.1) ICD10: Q02			
L_AL21_E	VSD (exact code) ICD9-CM: (745.4) ICD10: Q210	Binary	0 = No 1 = Yes	- Diagnosis - OP Diagnosis
L_AL22_E	ASD (exact code) ICD9-CM: (745.5) ICD10: Q211	Binary	0 = No 1 = Yes	- Diagnosis - OP Diagnosis
L_AL30_E	Hypoplastic left heart (exact code) ICD9-CM: (746.7) ICD10: Q234	Binary	0 = No 1 = Yes	- Diagnosis - OP Diagnosis
L_AL102_E	Cleft lip with or without cleft palate (exact code) ICD9-CM: (749.1, 749.2) ICD10: Q36, Q37	Binary	0 = No 1 = Yes	- Diagnosis - OP Diagnosis
L_AL103_E	Cleft palate (exact code) ICD9-CM: (749.0 excluding 749.02) ICD10: Q35 excluding Q357	Binary	0 = No 1 = Yes	- Diagnosis - OP Diagnosis
L_AL45_E	Hirschsprung's disease (exact code) ICD9-CM: (751.3) ICD10: Q431	Binary	0 = No 1 = Yes	- Diagnosis - OP Diagnosis
L_AL50_E	Gastroschisis (exact code) ICD9-CM: (756.73) ICD10: Q793	Binary	0 = No 1 = Yes	- Diagnosis - OP Diagnosis
L_AL51_E	Omphalocele (exact code) ICD9-CM: (756.72) ICD10: Q792	Binary	0 = No 1 = Yes	- Diagnosis - OP Diagnosis
L_AUD4_E	Unilateral renal agenesis (exact code) ICD9-CM: (753.0) ICD10: Q600	Binary	0 = No 1 = Yes	- Diagnosis - OP Diagnosis
L_AL55_E	Congenital hydronephrosis (exact code) ICD9-CM: (753.20) ICD10: Q620	Binary	0 = No 1 = Yes	- Diagnosis - OP Diagnosis
L_AL59_E	Hypospadias (exact code) ICD9-CM: (752.61) ICD10: Q54	Binary	0 = No 1 = Yes	- Diagnosis - OP Diagnosis
L_AL62_E	Limb reduction defects (exact code) ICD9-CM: (755.2 – 755.3) ICD10: Q71-Q73	Binary	0 = No 1 = Yes	- Diagnosis - OP Diagnosis
L_AL66_E	Club foot – talipes equinovarus (exact code) ICD9-CM: (754.51) ICD10: Q660	Binary	0 = No 1 = Yes	- Diagnosis - OP Diagnosis
L_AL68_E	Polydactyly (exact code)	Binary	0 = No 1 = Yes	- Diagnosis - OP Diagnosis

Variable name	*Variable definition/ description*	*Variable format*	*Variable values*	*Tables[2]*
	ICD9-CM: (755.0) ICD10: Q69			
L_AL89_E	Down syndrome (exact code) ICD9-CM: (758.0) ICD10: Q90	Binary	0 = No 1 = Yes	- Diagnosis - OP Diagnosis
Hospital data - appropriate codes				
L_AL1_A	All major Congenital Anomalies ICD9-CM: (740-759.9 excluding 749.02, 754.50, 754.52, 754.53, 754.59, 754.60, 754.61, 754.62, 754.69, 754.71, 754.79, 756.17 and 759.9) ICD10: Q chapter excluding Q357, Q661, Q662, Q663, Q664, Q665, Q666, Q667, Q668, Q669, Q760 and Q899	Binary	0 = No 1 = Yes	- Diagnosis - OP Diagnosis
L_AL6_A	Spina Bifida (appropriate code) ICD9-CM: (740-742) ICD10: Q00-Q07	Binary	0 = No 1 = Yes	- Diagnosis - OP Diagnosis
L_AL8_A	Severe microcephaly (appropriate code) ICD9-CM: (740-742) ICD10: Q00-Q07	Binary	0 = No 1 = Yes	- Diagnosis - OP Diagnosis
L_AL21_A	VSD (appropriate code) ICD9-CM: (745-747) ICD10: Q20-Q28	Binary	0 = No 1 = Yes	- Diagnosis - OP Diagnosis
L_AL22_A	ASD (appropriate code) ICD9-CM: (745-747) ICD10: Q20-Q28	Binary	0 = No 1 = Yes	- Diagnosis - OP Diagnosis
L_AL30_A	Hypoplastic left heart (appropriate code) ICD9-CM: (745-747) ICD10: Q20-Q28	Binary	0 = No 1 = Yes	- Diagnosis - OP Diagnosis
L_AL102_A	Cleft lip with or without cleft palate (appropriate code) ICD9-CM: (749) ICD10: Q35-Q37	Binary	0 = No 1 = Yes	- Diagnosis - OP Diagnosis
L_AL103_A	Cleft palate (appropriate code) ICD9-CM: (749 excluding 749.02) ICD10: Q35-Q37 excluding Q357	Binary	0 = No 1 = Yes	- Diagnosis - OP Diagnosis
L_AL45_A	Hirschsprung's disease (appropriate code) ICD9-CM: (751) ICD10: Q41-Q43	Binary	0 = No 1 = Yes	- Diagnosis - OP Diagnosis
L_AL50_A	Gastroschisis (appropriate code) ICD9-CM: (756.7) ICD10: Q79	Binary	0 = No 1 = Yes	- Diagnosis - OP Diagnosis
L_AL51_A	Omphalocele (appropriate code)	Binary	0 = No 1 = Yes	- Diagnosis - OP Diagnosis

Variable name	*Variable definition/ description*	*Variable format*	*Variable values*	*Tables[2]*
	ICD9-CM: (756.7) ICD10: Q79			
L_AUD4_A	Unilateral renal agenesis (appropriate code) ICD9-CM: (753) ICD10: Q60-Q64	Binary	0 = No 1 = Yes	- Diagnosis - OP Diagnosis
L_AL55_A	Congenital hydronephrosis (appropriate code) ICD9-CM: (753) ICD10: Q62-Q64	Binary	0 = No 1 = Yes	- Diagnosis - OP Diagnosis
L_AL59_A	Hypospadias (appropriate code) ICD9-CM: (752) ICD10: Q54-Q56	Binary	0 = No 1 = Yes	- Diagnosis - OP Diagnosis
L_AL62_A	Limb reduction defects (appropriate code) ICD9-CM: (754-755 excluding 754.50, 754.52, 754.53, 754.59, 754.60, 754.61, 754.62, 754.69, 754.71, 754.79) ICD10: Q65-Q74 excluding Q661, Q662, Q663, Q664, Q665, Q666, Q667, Q668, Q669	Binary	0 = No 1 = Yes	- Diagnosis - OP Diagnosis
L_AL66_A	Club foot – talipes equinovarus (appropriate code) ICD9-CM: (754-755 excluding 754.50, 754.52, 754.53,754.59, 754.60, 754.61, 754.62, 754.69, 754.71, 754.79) ICD10: Q65-Q74 excluding Q661, Q662, Q663, Q664, Q665, Q666, Q667, Q668, Q669	Binary	0 = No 1 = Yes	- Diagnosis - OP Diagnosis
L_AL68_A	Polydactyly (appropriate code) ICD9-CM: (754-755 excluding 754.50, 754.52, 754.53, 754.59, 754.60, 754.61, 754.62, 754.69, 754.71, 754.79) ICD10: Q65-Q74 excluding Q661, Q662, Q663, Q664, Q665, Q666, Q667, Q668, Q669	Binary	0 = No 1 = Yes	- Diagnosis - OP Diagnosis
L_AL89_A	Down syndrome (appropriate code) ICD9-CM: (758) ICD10: Q90-Q93, Q96-Q99	Binary	0 = No 1 = Yes	- Diagnosis - OP Diagnosis
Hospital data - minor / unspecified codes				
L_AL6_M	Spina Bifida (minor/ unspecified code) ICD9-CM: (756.17, 759.9) ICD10: Q760, Q899	Binary	0 = No 1 = Yes	- Diagnosis - OP Diagnosis
L_AL8_M	Severe microcephaly (unspecified code only) ICD9-CM: (759.9) ICD10: Q899			
L_A21_M	VSD (unspecified code only)			

Variable name	*Variable definition/ description*	*Variable format*	*Variable values*	*Tables[2]*
	ICD9-CM: (759.9) ICD10: Q899			
L_AL22_M	ASD (unspecified code only) ICD9-CM: (759.9) ICD10: Q899			
L_AL30_M	Hypoplastic left heart (unspecified code only) ICD9-CM: (759.9) ICD10: Q899			
L_AL102_M	Cleft lip with or without cleft palate (unspecified code only) ICD9-CM: (759.9) ICD10: Q899			
L_AL103_M	Cleft palate (minor/ unspecified code) ICD9-CM: (749.02, 759.9) ICD10: Q357, Q899	Binary	0 = No 1 = Yes	- Diagnosis - OP Diagnosis
L_AL45_M	Hirschsprung's disease (unspecified code only) ICD9-CM: (759.9) ICD10: Q899			
L_AL50_M	Gastroschisis (unspecified code only) ICD9-CM: (759.9) ICD10: Q899			
L_AL51_M	Omphalocele (unspecified code only) ICD9-CM: (759.9) ICD10: Q899			
L_AUD4_M	Unilateral renal agenesis (unspecified code only) ICD9-CM: (759.9) ICD10: Q899			
L_AL55_M	Congenital hydronephrosis (unspecified code only) ICD9-CM: (759.9) ICD10: Q899			
L_AL59_M	Hypospadias (unspecified code only) ICD9-CM: (759.9) ICD10: Q899			
L_AL62_M	Limb reduction defects (unspecified code only) ICD9-CM: (759.9) ICD10: Q899			
L_AL66_M	Club foot – talipes equinovarus (minor/ unspecified code) ICD9-CM: (754.50, 754.52, 754.53, 754.59, 754.60, 754.61, 754.62, 754.69, 754.71, 754.79, 759.9) ICD10: Q661, Q662, Q663, Q664, Q665, Q666, Q667, Q668, Q669, Q899	Binary	0 = No 1 = Yes	- Diagnosis - OP Diagnosis
L_AL68_M	Polydactyly (unspecified code only)			

Variable name	*Variable definition/ description*	*Variable format*	*Variable values*	*Tables[2]*
	ICD9-CM: (759.9) ICD10: Q899			
L_AL89_M	Down syndrome (unspecified code only) ICD9-CM: (759.9) ICD10: Q899			
Hospital data – organ subgroups (unspecified codes)				
L_UN_UNSPEC	Congenital malformation minor/ unspecified ICD9-CM: (749.02, 754.50, 754.52, 754.53,754.59, 754.60, 754.61, 754.62, 754.69, 754.71, 754.79, 756.17, 759.9) ICD10: Q357, Q661, Q662, Q663, Q664, Q665, Q666, Q667, Q668, Q669, Q760, and Q899	Binary	0 = No 1 = Yes	- Diagnosis - OP Diagnosis
L_UN_NS	CA of nervous system minor/unspecified ICD9-CM: (742.9, 756.17) ICD10: Q760, Q079	Binary	0 = No 1 = Yes	- Diagnosis - OP Diagnosis
L_UN_EYE	CA of eye unspecified ICD9-CM: (743.9) ICD10: Q159	Binary	0 = No 1 = Yes	- Diagnosis - OP Diagnosis
L_UN_EAR	CA of ear unspecified ICD9-CM: (744.3) ICD10: Q179	Binary	0 = No 1 = Yes	- Diagnosis - OP Diagnosis
L_UN_FACE	CA face and neck unspecified ICD9-CM: (744.9) ICD10: Q189	Binary	0 = No 1 = Yes	- Diagnosis - OP Diagnosis
L_UN_HEART	CA of heart, unspecified ICD9-CM: (746.9) ICD10: Q249	Binary	0 = No 1 = Yes	- Diagnosis - OP Diagnosis
L_UN_CIRCUL	CA of circulatory system, unspecified ICD9-CM: (747.9) ICD10: Q289	Binary	0 = No 1 = Yes	- Diagnosis - OP Diagnosis
L_UN_DIGEST	CA of digestive system, unspecified ICD9-CM: (751.9) ICD10: Q459	Binary	0 = No 1 = Yes	- Diagnosis - OP Diagnosis
L_UN_GENITAL	CA of genitals, unspecified ICD9-CM: (752.9) ICD10: Q529 and Q559	Binary	0 = No 1 = Yes	- Diagnosis - OP Diagnosis
L_UN_URIN	CA of urinary system, unspecified ICD9-CM: (753.9) ICD10: Q649	Binary	0 = No 1 = Yes	- Diagnosis - OP Diagnosis
L_UN_LIMB	CA of limb, minor/unspecified ICD9-CM: (754.50, 754.52, 754.53,	Binary	0 = No 1 = Yes	- Diagnosis - OP Diagnosis

Variable name	*Variable definition/ description*	*Variable format*	*Variable values*	*Tables[2]*
	754.59, 754.60, 754.61, 754.62, 754.69, 754.71, 754.79, 755.9) ICD10: Q661, Q662, Q663, Q664, Q665, Q666, Q667, Q668, Q669, Q749			
L_UN_CHROM	Chromosomal anomaly, unspecified ICD9-CM: (758.9) ICD10: Q999	Binary	0 = No 1 = Yes	- Diagnosis - OP Diagnosis

Appendix

EUROCAT list of minor congenital anomalies

Chapter 3.2, Guide 1.4: New List of Minor Anomalies for Use from Birth Year 2005 (https://eu-rd-platform.jrc.ec.europa.eu/sites/default/files/EUROCAT-Guide-1.4-Section-3.2.pdf).

	Specified ICD10-BPA – if present	**Specified ICD9-BPA – if present**
Head		
Aberrant scalp hair patterning		
Bony occipital spur		
Brachycephaly		
Compression facies	Q671	75401
Depressions in skull	Q6740	No ICD9 code
Dolichocephaly	Q672	75403
Dysmorphic face	Q189	
Facial asymmetry	Q670	75400
Flat occiput		
Frontal bossing / wide forehead		
Plagiocephaly – head asymmetry	Q673	75405
Macrocephalus	Q753	
Metopic ridge		
Metopic suture synostosis		
Other congenital deformities of skull, face and jaw	Q674	No ICD9 code
Third fontanel		
Eyes		
Blue sclera	Q135	74345
Congenital ectropion	Q101	74361
Congenital entropion	Q102	74362
Crocodile tears	Q0782	
Downward slanting palpebral fissures		
Dystopia canthorum		
Epicanthic folds		
Epicanthus inversus		
Exophthalmos		
Hypertelorism	Q752	75602
Hypotelorism		
Other congenital malformations of eyelid	Q103	74363
Short palpebral fissures		
Stenosis or stricture of lacrimal duct	Q105	74365
Synophrys	Q1880	
Upward slanting palpebral fissures		
Ears		
Absent tragus		
Accesorry auricle, preauricular appendage, tag or lobule	Q170	7441
Asymmetric size	Q173	74423
Auricular pit		
Bat ear, prominent ear	Q175	74422
Double lobule	Q170	7441

Lack of helical fold	Q173	74423
Low set ears	Q174	74424
Macrotia	Q171	74420
Microtia	Q172	74421
Narrow external auditory meatus		
Posterior angulation	Q173	74423
Preauricular sinus or cyst	Q181	74441
Primitive shape	Q173	74423
Protuberant ears	Q173	74423
Unspecified and minor malformation of ear	Q179	7443
Nose		
Anomalies of philtrum		
Broad nasal root, anomaly of nasal root		
Deviation of nasal septum	Q6741	75402
Dysmorphic nose	Q189	
Notched alas		
Small nares		
Oral regions		
Aberrant frenula		
Alveolar crest		
Borderline small mandible/ minor micrognathia		
Disturbances in tooth eruption		
Enamel hypoplasia		
Glossoptosis		
High arched palate	Q3850	75024
Macrocheilia	Q186	74482
Macroglossia	Q382	75012
Macrostomia	Q184	74480
Malformed teeth		
Microcheilia	Q187	74483
Microstomia	Q185	74481
Neonatal teeth		
Ranula		
Retrognathia	Q674	No ICD9 code
Thin lips		
Tongue tie or cyst of tongue	Q381	7500
Neck		
Congenital malformation of face and neck, unspecified	Q189	7449
Mild webbed neck		
Other branchial cleft malformations	Q182	74448
Preauricular sinus or cyst	Q181	74441
Sinus, fistula or cyst of branchial cleft	Q180	74440
Torticollis	Q680	75686
Hands		
Accessorry carpal bones	Q7400	
Arachnodactyly		
Clinodactyly (5th finger)	Q6810	No ICD9 code
Duplication of thumbnail		
Enlarged or hypertrophic nails	Q845	75751
Overlapping fingers		

Short fingers (4. 5. th finger)		
Single/abnormal palmar crease	Q8280	7572
Small fingers		
Unusual dermatoglyphics		
Feet -Limb		
Clicking hip, subluxation or unstable hip	Q653-Q656	75431
Clubfoot of postural origin - other cong deformities of feet	Q668	75473
Congenital deformity of feet, unspecified	Q669	75478
Congenital pes planus	Q665	75461
Enlarged or hypertrophic nails	Q845	75751
Gap between toes (1st-2nd)		
Hallux varus – other congenital varus deformities of feet	Q663	75459
Metatarsus varus – other congenital valgus deformities of feet	Q666	75469
Metatarsus varus or metatarsus adductus	Q662	75452
Overlapping toes		
Pes cavus	Q667	75470
Prominent calcaneus		
Recessed toes (4th, 5th)		
Short great toe		
Syndactyly (2nd-3rd toes)		
Talipes or pes calcaneovalgus	Q664	75460
Skin		
Accessory nipples	Q833	75765
Angioma		
Cafe-au-lait spot		
Depigmented spot		
Hemangioma if no treatment is required		
Heterochromia of hair		
Hypoplasia of toe nails		
Lymphangioma		
Mongoloid spot (whites)	Q8252	
Neavus flammeus	Q8250	
Persistent lanugo		
Pigmented naevus – congenital non-neoplastic naevus	Q825	75738
Strawberry naevus	Q8251	
Unusual placement of nipples/ wide spaced nipples		
Skeletal		
Abortive 12.th rib		
Absence of rib	Q7660	75630
Accessory rib	Q7662	75633
Cervical rib	Q765	7562
Congenital bowing of femur	Q683	
Congenital bowing of fibula and tibia	Q684	
Congenital bowing of long bones of leg, unspecified	Q685	75569
Congenital bowing of upper limb		
Congenital deformity of spine	Q675	75619
Congenital lordosis, postural	Q7643	75421
Cubitus valgus		
Depressed sternum	Q676	75481
Fused rib, single		

Genu recurvatum	Q6821	
Genua valgum		
Genua varum		
Prominent sternum	Q677	75480
Sacral dimple		
Shieldlike chest, other congenital deformities of chest	Q678	75639
Spina bifida occulta	Q760	75610
Sternum bifidum	Q7671	75636
Brain		
Anomalies of septum pellucidum		
Arachnoid cyst		
Choroid plexus cyst		
Periventricular leukomalacia		
Single congenital cerebral cyst	Q0461	No ICD9 code
Cardiovascular		
Absence or hypoplasia of umbilical artery, single umbilical artery	Q270	7475
Functional or unspecified cardiac murmur		
Patent ductus arteriosus if GA < 37 weeks	Q250 if GA	7470 if
Patent or persistent foramen ovale	Q2111	74550
Peripheral pulmonary artery stenosis	Q256 if GA <	
Persistent left superior vena cava	Q261	74741
Persistent right aortic arch	Q2541	74723
Pulmonary		
Accessory lobe of lung	Q331	74862
Azygos lobe of lung	Q3310	
Congenital laryngeal stridor	Q314	74836
Hyperplasia of thymus		
Laryngomalacia	Q314, Q315	74832
Pleural effusion		
Thymus involution		
Tracheomalacia	Q320	74832
Vocal cord palsy		
Gastro-intestinal		
Abdominal cyst		
Anterior anus		
Congenital cholestasis		
Congenital mesenteric cyst		
Diastasis recti		
Functional gastro-intestinal disorders	Q4021,	
Hiatus hernia	Q401	7506
Inguinal hernia		
Meckel's diverticulum	Q430	75101
Plica of anus		
Pyloric stenosis	Q400	7505
Transient choledochal cyst		
Umbilical hernia		
Renal		
Hydronephrosis with a pelvis dilatation less than 10 mm		
Hyperplastic and giant kidney	Q633	75334
Single renal cyst	Q610	75310

Vesico-ureteral-renal reflux	Q627	
External genitals		
Bifid scrotum	Q5521	
Congenital malformation of vulva	Q527	75244
Curvature of penis		
Cysts of vulva		
Deficient or hooded foreskin		
Developmental ovarian cyst		
Enlarged clitoris		
Fusion of labia	Q525	
Hydrocele of testis		
Hymen imperforatum	Q523	75243
Hypertrophia of hymen		
Hypoplasia of penis		
Phymosis		
Prominent labia minora		
Retractile testis	Q5520	
Transient ovarian cyst		
Undescended testicle	Q53	7525
Unspecified ectopic testis		
Vaginal skin tag		
Other		
Congenital malformation, unspecified	Q899	75999
Chromosomal		
Balanced translocations or inversions in normal individuals	Q950, Q951	7584

Appendix 4: Questionnaire on Algorithms

EUROlinkCAT WP 6 Questionnaire on use of HCD and algorithms

Dear Registry Leader,

As part of the EUROlinkCAT project we are developing publicly available algorithms that use health care databases (HCD)* in the surveillance of congenital anomalies. We hope this will enable EUROCAT registries to improve their surveillance and also enable areas without registries to have good quality data for certain anomalies. We also know some of you go to hospitals yourselves and data collection may vary in your registry by hospital. This can vary from an algorithm, registry staff looking at computer files, (semi-automated) to going to paper files and looking for cases by hand (very very time consuming).
We would like to know where algorithms are used (in case selection and or validation) so that we can pool our current knowledge.

*: Health Care Databases are any routine electronic records collected about a woman's health and pregnancy and include hospital databases, cytogenetic and biochemical laboratory records, ultrasound units, screening records, prescription databases etc.

EUROlinkCAT Algorithm Survey

Country
Registry
Person completing the questionnaire (name, role, email)

1. **How do you ascertain congenital anomaly cases? (please highlight all relevant options)**
   1.1. Cases are reported directly by clinicians
   1.2. Cases are extracted from one or more healthcare databases using automatic selection and validation criteria and accepted without review
   1.3. Cases are extracted from one or more healthcare databases using automatic selection and validation criteria and then are reviewed manually
   1.4. We search hospital records by hand Other system – please explain
2. **For EACH HCD you use:**
   2.1. What is the name of the HCD
   2.2. Please describe its function
   2.3. Do you have automatic access to this HCD or do you have to ask permission to use it?
   2.4. Please describe the information it collects
   2.5. Please describe the criteria for including cases
   2.6. Please describe the criteria for excluding cases
   2.7. Please describe any validation criteria used to confirm cases (e.g. surgery record for cleft lip)
   2.8. What actions do you take about uncertain cases?
   2.9. Do you have a computer algorithm to extract data from this HCD?

3. **Computer Algorithms**
   3.1. Please could you share any algorithms you have (any computer language is fine)
   3.2. If it is not possible to share the algorithm itself, please could you describe in detail the steps in the algorithm
4. **Please indicate which of the following limitations of HCDs for CA registration apply to your circumstances (Yes/No):**
   4.1.1. Limited number of diagnoses can be recorded (e.g. SDO Italy only 6)
   4.1.2. Limited type of diagnosis codes can be recorded
   4.1.3. No written text description is available
   4.1.4. Frequent use of generic codes (e.g. Other anomaly of face and neck)
   4.1.5. Codes are for reimbursement, therefore more serious conditions are more likely to be recorded
   4.1.6. Where no care is required CA are missed (e.g. Downs syndrome)
   4.1.7.Minor or poorly defined Anomalies which are excluded in Guide1.4 are recorded
   4.1.8. Conditions that may resolve after birth are recorded (e.g. PDA at <37 weeks GA)
   4.1.9. Conditions that may only be diagnosed after the first few months of life are not recorded

4.1.10. The database originated mainly for administrative and not epidemiological-scientific aims

4.1.11. Detail in the clinical description of the defect rarely reaches the fifth digit of the ICD9-CM code

4.1.12. Inaccurate identification and classification of anomalies: some anomalies have an ICD9-CM macrocode that includes several ICD9-BPA or ICD10 codes

4.1.13. Inappropriate coding (wrong ICD9, ICD9 of adult and not newborn e.g. ICD10 hydronephrosis)

4.1.14. Generic coding such as "Not otherwise specified" (NAS), "Without other indications" (SAI) and "Not indicated elsewhere" (NIA) which make the case doubtful and of poor reliability

4.1.15. The confirmation of the cases requires medical evaluation and the need to request clinical information available in clinical files, with considerable expenditure of time and energy

Thank you for completing the questionnaire. Please send completed questionnaires to:

Dr Amanda Neville
nvm@unife.it

Appendix 5: Algorithm tables

For Algorithm Table 1 and Table 2, see page 63

Table 3: CAs with inappropriate coding	
ICD9-CM	**Pathology**
2280	HEMANGIOMA
22801	HEMANGIOMA OF THE SKIN AND SUBCUTANEOUS TISSUE
22804	HEMANGIOMA OF THE INTRAABDOMINAL STRUCTURES
22809	HEMANGIOMA FROM OTHER LOCATIONS
2281	LYMPHANGIOMA, ANY LOCATION
23770	NEUROFIBROMATOSIS, NOT SPECIFIED
243	CONGENITAL HYPOTHYROIDISM
2552	ADRENOGENITAL SYNDROMES
2594	NANISM, NOT ELSEWHERE CLASSIFIED
27911	DIGEORGE VELOCARDIOFACIAL SYNDROME
3154	DEVELOPMENTAL COORDINATION DISORDER
3313	COMMUNICATING HYDROCEPHALUS
3314	OBSTRUCTIVE HYDROCEPHALUS
3480	CEREBRAL CYST
3488	OTHER MORBID CONDITIONS OF THE BRAIN
3489	UNSPECIFIED MORBID CONDITIONS OF THE BRAIN
36900	BLINDNESS IN BOTH EYES, LEVEL OF DAMAGE NOT FURTHER SPECIFIED
37103	CENTRAL OPACITY OF THE CORNEA
37446	BLEPHAROPHIMOSIS
37743	OPTIC NERVE HYPOPLASIA
3962	MITRAL VALVE INSUFFICIENCY AND AORTIC VALVE STENOSIS
4240	MITRAL VALVE DISORDERS
4242	TRICUSPID VALVE DISORDERS
4243	PULMONARY VALVE DISORDERS
4293	CARDIOMEGALIA
4299	UNSPECIFIED HEART DISEASE
44389	OTHER PERIPHERAL VASCULAR DISEASES
4481	NEVUS, NON NEOPLASTIC
4489	OTHER AND UNSPECIFIED DISEASES OF THE CAPILLARIES
5240	CONGENITAL MALFORMATIONS OF THE SKULL, FACE AND JAW
53084	TRACHEO-ESOPHAGEAL FISTULA
5513	DIAPHRAGMATIC HERNIA, WITH GANGRENE
5523	DIAPHRAGMATIC HERNIA, WITH OBSTRUCTION
5533	DIAPHRAGMATIC HERNIA, WITHOUT MENTION OF OBSTRUCTION OR GANGRENE
56089	OTHER SPECIFIED OCCLUSION OF THE INTESTINE
5609	INTESTINAL OCCLUSION NOT SPECIFIED
5651	ANAL FISTULA
591	HYDRONEPHROSIS
5935	HYDROURETER
59370	VESICOURETERAL REFLUX, UNSPECIFIED OR WITHOUT REFLUX DISEASE
59371	VESICOURETERAL REFLUX, WITH REFLUX NEPHROPATHY, UNILATERAL
59372	VESICOURETERAL REFLUX, WITH REFLUX NEPHROPATHY, BILATERAL
59373	VESICOURETERAL REFLUX, WITH REFLUX NEPHROPATHY
59382	URETERAL FISTULA
5939	UNSPECIFIED PATHOLOGY OF THE KIDNEY AND URETHER
60789	OTHER SPECIFIED PATHOLOGIES OF THE PENIS
6202	OTHER UNSPECIFIED OVARIAN CYST
70900	DYSCHROMIA, NOT SPECIFIED
7091	VASCULAR ALTERATIONS OF THE SKIN
7098	OTHER SPECIFIED SKIN CHANGES
73399	OTHER BONE AND CARTILAGE DISORDERS
7359	UNSPECIFIED TOE DEFORMATIONS
7365	GENE RECURVATUM
73671	CLUBFOOT
76076	FETAL ALCOHOL SYNDROME
7628	AMNIOTIC BANDS
7710	CONGENITAL RUBELLA
7711	CONGENITAL CYTOMEGALIC VIRUS INFECTION
7712	OTHER CONGENITAL INFECTIONS, SPECIFIC TO THE PERINATAL PERIOD
7750	DIABETIC MOTHER
7780	FETAL HYDROPE NOT BY ISOIMMUNIZATION
78343	SHORT STATURE
V293	SUSPICION OF GENETIC OR METABOLIC MORBID CONDITION
V4561	CATARACT SURGERY

Table 4: CAs that are not included in the EUROCAT list of minors and should be excluded regardless of whether there is a major congenital anomaly present or not (CNS and CHD groups)

ICD9-CM	Pathology
74361	CONGENITAL PTOSIS
74362	DEFORMED CONGENITAL EYELID
74363	SPECIF MALFORMATION OF THE EYELID NOS
74364	SPECIF MALFORMATION OF THE TEAR GLAND
74365	SPECIF MALFORMATION OF THE TEAR DUCT
74369	OTHER MALFORMATION OF THE EYELID/TEAR DUCT
7439	UNSPECIFIED ABNORMALITIES OF THE EYE
74421	CONGENITAL ABSENCE OF EAR LOBE
74424	SPECIFIED ANOMALIES OF THE EUSTACHIAN TUBE
74429	OTHER EAR MALFORMATION
7443	MALFORMATION EAR
74686	CONGENITAL CARDIO BLOCK
74783	PERSISTENT FETAL CIRCULATION
7482	LARYNGEAL MEMBRANE
74860	PULMONARY MALFORMATION NOS
74861	CONGENITAL BRONCHIECTASIS
74869	OTHER MALFORMATION LARING/TRACHEA
7488	RESPIRATORY MALFORMATION NOS
7489	SPECIFIC MALFORMATION OF RESPIRATORY SYSTEM NOS
7500	TIED TONGUE
75010	MALFORMATION OF THE TONGUE
75012	ADHERENT CONGENITAL TONGUE
75013	TONGUE FISSURE
75016	MICROGLOSSIA
75019	OTHER TONGUE ANOMALIES
75021	ABSENCE OF SALIVARY GLANDS
75022	ACCESSORY SALIVARY GLANDS
75023	SALIVARY DUCT ATRESIA
75024	CONGENITAL FISTULA OF THE SALIVARY GLAND
75027	DIVERTICULUM OF THE PHARYNX
7509	SUPERIOR MALFORMATION OF THE DIGESTIVE SYSTEM
75251	UNDESCENDED TESTICLE
75552	CONGENITAL ELEVATION OF THE SCAPULA
75566	MALFORMATION OF THE TOES NOS
7570	HEREDITARY EDEMA LEG
7572	DERMATOGLYPHIC ANOMALY
7574	HAIR MALFORMATION
7579	INTEGUMENTARY MALFORMATION
7592	ABNORMALITIES OF OTHER ENDOCRINE GLANDS

Table 5: Minor CAs as specified by EUROCAT	
ICD9-CM	**Pathology**
75459	OTHER MALFORMATION OF THE FOOT IN VARISM
75269	OTHER PENILE ABNORMALITIES
7563	OTHER ANOMALIES OF THE RIBS AND STERNUM
75739	OTHER UNSPECIFIED SKIN ABNORMALITIES
74489	OTHER UNSPECIFIED FACIAL AND NECK ABNORMALITIES
75489	OTHER UNSPECIFIED NON-TERATOGENIC ABNORMALITIES
7438	OTHER SPECIFIED ABNORMALITIES OF THE EYE
7548	OTHER SPECIFIED NON-TERATOGENIC ABNORMALITIES
74449	OTHER CYSTS OR BRANCHIAL FISTULA
7547	OTHER FOOT MALFORMATION
75479	OTHER UNSPECIFIED FOOT MALFORMATION
75732	VASCULAR HAMARTOMES
7599	CONGENITAL ANOMALIES, NOT SPECIFIED
75733	PIGMENT SKIN ABNORMALITIES, CONGENITAL
7591	ABNORMALITIES OF THE ADRENAL GLAND
7449	UNSPECIFIED FACIAL AND NECK ABNORMALITIES
7576	SPECIFIC ANOMALIES OF THE BREAST
7475	UMBILICAL ARTERY, ABSENCE OF
74442	BRANCHIAL CYSTS
74441	CYSTS OR BRANCHIAL FISTULA
74447	PREAURICULAR CYSTS
75311	CONGENITAL RENAL CYST, SINGLE
7562	CERVICAL RIB
75561	COXA VALGA, CONGENITAL
75562	COXA VARA, CONGENITAL
75263	ABNORMAL CURVATURE OF THE PENIS, CONGENITAL
7542	POSTURAL DEFORMITY OF THE SPINE
7455	ATRIAL SEPTUM DEFECT TYPE OSTIUM SECUNDUM
7510	MECKEL'S DIVERTICULUM
7506	CONGENITAL HYATAL HERNIA
75242	IMPERFORATED HYMEN
74481	MACROCHEILIA
75015	MACROGLOSSIA
74483	MACROSTOMIA
74422	MACROTIA
7483	MALFORMATION LARING/TRACHEA
7575	MALFORMATION OF THE NAIL NEC
7546	FOOT MALFORMATION IN VALGUS
75453	METATARSAL VARO
75452	PRIMITIVE VARUS METATARSUS
74482	MICROCHEILIA
74484	MICROSTOMIA
74423	MICROTIA
7541	STERNOCLEIDOMASTOIDE MUSCLE, CONGENITAL MALFORMATION
74443	CERVICAL AURICLE
7441	ACCESSORY EXTERNAL EAR
75481	PECTUS EXCAVATUM
75265	HIDDEN PENIS
75482	PECTUS CARINATUM (KEELED CHEST)
75471	TALIPES CAVUS
7525	TESTICULAR RETENTION
74446	PREAURICULAR FISTULA OR PIT
75513	SYNDACTYLYOF THE FOOT WITHOUT BONE FUSION
75617	SPINA BIFIDA OCCULTA
7505	PYLORIC STENOSIS CONGENITAL
75433	CONGENITAL HIP DISLOCATION, BILATERAL
75432	CONGENITAL HIP DISLOCATION, UNILATERAL
75252	RETRACTABLE TESTICLE

Table 6: Exclusion filters for selected CAs				
ICD9-CM	**Pathology**	**Premature**	**Short length of stay in hospital†**	**AND/OR**
7421	MICRO CEPHALY	YES		
7422	OTHER REDUCTION DEFORMITIES OF BRAIN	YES	YES	AND
7423	OTHER CONGENITAL HYDROCEPHALUS	YES		
7424	OTHER SPECIFIED CONGENITAL MALFORMATIONS OF BRAIN	YES	YES	AND
74259	OTHER UNSPECIFIED SPINAL CORD ABNORMALITIES	YES	YES	OR
7428	CONGENITAL MALFORMATION OF BRAIN, UNSPECIFIED	YES	YES	AND
7429	CONGENITAL MALFORMATION OF NERVOUS SYSTEM, UNSPECIFIED	YES	YES	OR
74356	OTHER CONGENITAL ALTERATIONS OF THE RETINA	YES		
74366	SPECIFIED CONGENITAL ANOMALIES OF THE ORBIT	YES		
7454	VENTRICULAR SEPTAL DEFECT	YES		
7458	OTHER CONGENITAL MALFORMATIONS OF CARDIAC SEPTA	YES	YES	AND
7459	CONGENITAL MALFORMATION OF CARDIAC SEPTUM, UNSPECIFIED	YES	YES	AND
74609	OTHER UNSPECIFIED CONGENITAL ABNORMALITIES OF THE HEART	YES	YES	AND
74689	OTHER NOT SPECIFIED ANOMALIES OF THE HEART	YES	YES	AND
7469	NOT SPECIFIED ANOMALIES OF THE HEART	YES	YES	AND
7470	PATENT DUCTUS ARTERIOSUS	YES		
74729	CONGENITAL MALFORMATION OF CIRCULATORY SYSTEM, UNSPECIFIED		YES	
7476	OTHER ABNORMALITIES OF THE PERIPHERAL VASCULAR SYSTEM	YES		
7478	OTHER SPECIFIED ABNORMALITIES OF THE CIRCULATORY SYSTEM		YES	
7479	UNSPECIFIED ABNORMALITIES OF THE CIRCULATORY SYSTEM		YES	
7483	OTHER ABNORMALITIES OF THE LARYNX, TRACHEA AND BRONCHI		YES	
74860	ANOMALY OF LUNG, UNSPECIFIED	YES		
74869	UNSPECIFIED CONGENITAL ANOMALIES OF THE RESPIRATORY SYSTEM	YES		
7489	UNSPECIFIED ABNORMALITIES OF THE RESPIRATORY SYSTEM	YES		
75026	OTHER SPECIFIED ABNORMALITIES OF THE MOUTH		YES	
75029	OTHER SPECIFIED ANOMALIES OF THE PHARYNX		YES	
7504	OESOPHAGEAL MALFORMATION NOS		YES	
7509	UNSPECIFIED ABNORMALITIES OF THE UPPER ALIMENTARY TRACT		YES	
7515	OTHER ABNORMALITIES OF THE INTESTINE		YES	
75169	OTHER ABNORMALITIES OF THE GALLBLADDER, BILE DUCTS AND LIVER		YES	
7519	UNSPECIFIED ABNORMALITIES OF THE DIGESTIVE SYSTEM		YES	
75219	OTHER CONGENITAL ANOMALIES OF THE GENITAL ORGANS	YES	YES	AND
75269	OTHER PENILE ABNORMALITIES	YES	YES	AND
7529	UNSPECIFIED ABNORMALITIES OF THE GENITAL ORGANS	YES	YES	AND
7539	UNSPECIFIED ABNORMALITIES OF THE URINARY SYSTEM	YES		
75479	OTHER UNSPECIFIED FOOT MALFORMATIONS	YES		
75489	OTHER UNSPECIFIED NON-TERATOGENIC ABNORMALITIES	YES		
75560	UNSPECIFIED LOWER LIMB ANOMALIES	YES	YES	AND
75569	OTHER UNSPECIFIED LOWER LIMB ABNORMALITIES	YES	YES	AND
7559	UNSPECIFIED ANOMALIES OF UNSPECIFIED LIMB	YES	YES	AND
7569	OTHER AND UNSPECIFIED MUSCULOSKELETAL SYSTEM ABNORMALITIES	YES	YES	AND
75989	OTHER UNSPECIFIED ANOMALIES	YES	YES	OR
7599	CONGENITAL ANOMALIES, NOT SPECIFIED	YES	YES	OR

† = Short length of stay is a stay less than the median number of days for healthy births

Table 7: Clinically validated CAs	
ICD9-CM	**Pathology**
2281	LYMPHANGIOMA, ANY LOCATION
7560	MACROCEPHALY
2594	DWARFISM, NOT CLASSIFIED ELSEWHERE
740	ANENCEPHALY
741	SPINA BIFIDA
7420	ENCEFALOCELE
7451	TRANSPOSITION OF LARGE VESSELS
7452	TETRALOGY OF FALLOT
7453	UNIQUE VENTRICLE
7454	INTERVENTRICULAR SEPTAL DEFECT
7467	HYPOPLASTIC LEFT HEART SYNDROME
749	CLEFT PALATE AND CLEFT LIP
7503	TRACHEOESOPHAGEAL FISTULA, ESOPHAGEAL ATRESIA AND STENOSIS
7512	ATRESIA AND STENOSIS OF THE LARGE INTESTINE, RECTUM AND CANAL
75261	HYPOSPADIAS
7530	AGENESIS AND DYSGENESIS OF THE KIDNEY
7550	POLYDACTYLY
75510	LIMB MALFORMATION, MULTIPLE AND UNSPECIFIED SITES
75511	MALFORMATION OF FINGERS OF THE HAND WITHOUT FUSION OF THE BONE
75512	MALFORMATION OF FINGERS OF THE HAND WITH FUSION OF THE BONE
75514	MALFORMATION OF TOES WITH BONE FUSION
7552	DEFECT IN REDUCTION OF THE UPPER LIMB
7553	DEFECT IN REDUCTION OF THE LOWER LIMB
75555	ACROCEPHALOSYNDACTILIA
75616	KLIPPEL-FEIL SYNDROME
7567	ABDOMINAL WALL ABNORMALITIES
7580	TRISOMY 21
7581	TRISOMY 13
7582	TRISOMY 18
75831	CRI-DU-CHAT SYNDROME
75832	DIGEORGE VELOCARDIOFACIAL SYNDROME
7585	OTHER CONDITIONS DUE TO AUTOSOMAL ABNORMALITIES
7586	GONADAL DYSGENESIS
7587	KLINEFELTER SYNDROME
75881	OTHER CONDITIONS DUE TO ABNORMALITIES OF SEX CHROMOSOMES
7593	SITUS INVERSUS
7594	JOINT TWINS
75981	PRADER-WILLI SYNDROME
75982	MARFAN SYNDROME
75983	FRAGILE X SYNDROME
V4561	POSTSURGICAL STATE FOLLOWING CATARACT EXTRACTION

Table 8: Specific procedures that will validation the CA code		
ICD9-CM	**Pathology**	**Surgery**
741	SPINA BIFIDA	OTHER CRANIECTOMY
741	SPINA BIFIDA	OTHER REPAIR OF CEREBRAL MENINGES
741	SPINA BIFIDA	ANASTOMOSIS BETWEEN VENTRICLE, ABDOMINAL CAVITY AND ITS ORGANS
741	SPINA BIFIDA	REMOVAL OR DEMOLITION OF SPINAL CORD OR MENINGES INJURY
741	SPINA BIFIDA	SPINAL MENINGOCELE REPAIR
741	SPINA BIFIDA	SPINAL MYELOMENINGOCELE REPAIR
742	OTHER CONGENITAL ABNORMALITIES OF THE NERVOUS SYSTEM	OTHER REMOVAL OR DEMOLITION OF BRAIN INJURY OR TISSUE
742	OTHER CONGENITAL ABNORMALITIES OF THE NERVOUS SYSTEM	OTHER CRANIECTOMY
742	OTHER CONGENITAL ABNORMALITIES OF THE NERVOUS SYSTEM	OTHER CRANIOTOMY
742	OTHER CONGENITAL ABNORMALITIES OF THE NERVOUS SYSTEM	OTHER SURGICAL OCCLUSION OF INTRACRANIAL VESSELS
742	OTHER CONGENITAL ABNORMALITIES OF THE NERVOUS SYSTEM	OTHER REPAIR OF CEREBRAL MENINGES
742	OTHER CONGENITAL ABNORMALITIES OF THE NERVOUS SYSTEM	OTHER PERMANENT TRACHEOSTOMY
742	OTHER CONGENITAL ABNORMALITIES OF THE NERVOUS SYSTEM	OTHER REPAIRS AND PLASTICS ON THE SPINAL CORD
742	OTHER CONGENITAL ABNORMALITIES OF THE NERVOUS SYSTEM	OTHER INTERVENTIONS FOR VENTRICULAR DRAINAGE
742	OTHER CONGENITAL ABNORMALITIES OF THE NERVOUS SYSTEM	ANASTOMOSIS BETWEEN VENTRICLE, ABDOMINAL CAVITY AND ITS ORGANS
742	OTHER CONGENITAL ABNORMALITIES OF THE NERVOUS SYSTEM	OPENING OF SKULL SUTURES
742	OTHER CONGENITAL ABNORMALITIES OF THE NERVOUS SYSTEM	REMOVAL OF BRANCHIAL CYSTS OR BRANCIAL FISURE
742	OTHER CONGENITAL ABNORMALITIES OF THE NERVOUS SYSTEM	REMOVAL OF SKULL LESIONS
742	OTHER CONGENITAL ABNORMALITIES OF THE NERVOUS SYSTEM	INSERTION OF CATHETER INTO THE VERTEBRAL CANAL BY INFUSION OF THERAPEUTIC OR PALLIATIVE SUBSTANCES
742	OTHER CONGENITAL ABNORMALITIES OF THE NERVOUS SYSTEM	TOTAL OSTEOTOMY OF OTHER FACIAL BONES WITH SIMULTANEOUS RECONSTRUCTION
742	OTHER CONGENITAL ABNORMALITIES OF THE NERVOUS SYSTEM	RACHICENTESIS
742	OTHER CONGENITAL ABNORMALITIES OF THE NERVOUS SYSTEM	REPAIR OF INTERATRIAL SEPTAL DEFECT WITH PROSTHESIS, OPEN TECHNIQUE
742	OTHER CONGENITAL ABNORMALITIES OF THE NERVOUS SYSTEM	SPINAL MENINGOCELE REPAIR
742	OTHER CONGENITAL ABNORMALITIES OF THE NERVOUS SYSTEM	SPINAL MYELOMENINGOCELE REPAIR
742	OTHER CONGENITAL ABNORMALITIES OF THE NERVOUS SYSTEM	REPLACEMENT OF VENTRICULAR ANASTOMOSIS
742	OTHER CONGENITAL ABNORMALITIES OF THE NERVOUS SYSTEM	CARDIOTOMY
742	OTHER CONGENITAL ABNORMALITIES OF THE NERVOUS SYSTEM	VENTRICULOSTOMY
743	CONGENITAL ABNORMALITIES OF THE EYE	OTHER SECONDARY CATARACT EXTRACTION
743	CONGENITAL ABNORMALITIES OF THE EYE	OTHER EXTRACAPSULAR EXTRACTION OF THE LENS
743	CONGENITAL ABNORMALITIES OF THE EYE	OTHER INTRACAPSULAR EXTRACTION OF THE LENS
743	CONGENITAL ABNORMALITIES OF THE EYE	OTHER SCLERAL FISTULIZATION WITH IRIDECTOMY
743	CONGENITAL ABNORMALITIES OF THE EYE	OTHER IRIDECTOMY
743	CONGENITAL ABNORMALITIES OF THE EYE	OTHER IRIDOTOMY
743	CONGENITAL ABNORMALITIES OF THE EYE	OTHER DIAGNOSTIC PROCEDURE ON THE CORNEA
743	CONGENITAL ABNORMALITIES OF THE EYE	OTHER DIAGNOSTIC PROCEDURE ON THE IRIS, CILIARY BODY, SCLERA AND ANTERIOR CHAMBER
743	CONGENITAL ABNORMALITIES OF THE EYE	OTHER REMOVAL OF THE VITREOUS BODY
743	CONGENITAL ABNORMALITIES OF THE EYE	OTHER MECHANICAL VITRECTOMY
743	CONGENITAL ABNORMALITIES OF THE EYE	OTHER SCLERA FISTULIZATION INTERVENTIONS
743	CONGENITAL ABNORMALITIES OF THE EYE	OTHER INTERVENTIONS ON THE VITREOUS BODY
743	CONGENITAL ABNORMALITIES OF THE EYE	OTHER INTERVENTIONS ON THE LENS
743	CONGENITAL ABNORMALITIES OF THE EYE	OTHER INTERVENTIONS ON THE ANTERIOR CHAMBER
743	CONGENITAL ABNORMALITIES OF THE EYE	OTHER INTERVENTIONS ON THE CORNEA
743	CONGENITAL ABNORMALITIES OF THE EYE	OTHER INTERVENTIONS ON THE RETINA, CHOROID AND POSTERIOR CHAMBER
743	CONGENITAL ABNORMALITIES OF THE EYE	OTHER INTERVENTIONS ON THE ORBIT
743	CONGENITAL ABNORMALITIES OF THE EYE	SURGICAL REMOVAL OF SECONDARY CATARACTS
743	CONGENITAL ABNORMALITIES OF THE EYE	REMOVAL OF ORBITAL INJURY
743	CONGENITAL ABNORMALITIES OF THE EYE	REMOVAL OR DEMOLITION OF SCLERA LESION
743	CONGENITAL ABNORMALITIES OF THE EYE	REMOVAL OR DEMOLITION OF LESION OF THE IRIS AND CILIARY BODY
743	CONGENITAL ABNORMALITIES OF THE EYE	SURGICAL CAPSULOTOMY AFTER CATARACT EXTRACTION
743	CONGENITAL ABNORMALITIES OF THE EYE	YAG-LASER CAPSULOTOMY AFTER CATARACT EXTRACTION
743	CONGENITAL ABNORMALITIES OF THE EYE	CYCLOPHOTOCOAGULATION
743	CONGENITAL ABNORMALITIES OF THE EYE	CHOREOPLASTICS
743	CONGENITAL ABNORMALITIES OF THE EYE	CORRETION OF BLEPHAROPHYTOSIS WITH OTHER TECHNIQUE
743	CONGENITAL ABNORMALITIES OF THE EYE	MECHANICAL FRAGMENTATION AND SUCTION OF THE CATARACT
743	CONGENITAL ABNORMALITIES OF THE EYE	EXTRACAPSULAR EXTRACTION OF THE LENS WITH SIMPLE SUCTION TECHNIQUE (AND IRRIGATION)
743	CONGENITAL ABNORMALITIES OF THE EYE	EXTRACAPSULAR EXTRACTION OF THE LENS, LINEAR EXTRACTION
743	CONGENITAL ABNORMALITIES OF THE EYE	INTRACAPSULAR EXTRACTION OF THE LENS BY TIME
743	CONGENITAL ABNORMALITIES OF THE EYE	PHACOEMULSIFICATION AND ASPIRATION OF CATARACTS
743	CONGENITAL ABNORMALITIES OF THE EYE	PHACOFRAGMENTATION AND CATARACT ASPIRATION VIA PARS PLANA
743	CONGENITAL ABNORMALITIES OF THE EYE	GONIOTOMY WITH GONIOPUNCTURE
743	CONGENITAL ABNORMALITIES OF THE EYE	SECONDARY IMPLANTATION OF ARTIFICIAL LENS
743	CONGENITAL ABNORMALITIES OF THE EYE	CORNEAL INCISION
743	CONGENITAL ABNORMALITIES OF THE EYE	INJECTION OF VITREOUS SUBSTITUTES
743	CONGENITAL ABNORMALITIES OF THE EYE	INSERTION OF ARTIFICIAL INTRAOCULAR LENS AT THE TIME OF CATARACT EXTRACTION, PERFORMED
743	CONGENITAL ABNORMALITIES OF THE EYE	SECONDARY INSERTION OF OCULAR IMPLANT
743	CONGENITAL ABNORMALITIES OF THE EYE	LYSIS OF ADHESIONS OF THE CONJUNCTIVA AND EYELID
743	CONGENITAL ABNORMALITIES OF THE EYE	LYSIS OF OTHER ANTERIOR SYNECHIAE
743	CONGENITAL ABNORMALITIES OF THE EYE	LYSIS OF POSTERIOR SYNECHIAE
743	CONGENITAL ABNORMALITIES OF THE EYE	PARACENTESIS OF THE ANTERIOR CHAMBER
743	CONGENITAL ABNORMALITIES OF THE EYE	PARACENTESIS OF THE ANTERIOR CHAMBER
743	CONGENITAL ABNORMALITIES OF THE EYE	SCLERAL CLOSURE WITH IMPLANT
743	CONGENITAL ABNORMALITIES OF THE EYE	REVISION AND REINSERTION OF OCULAR IMPLANT
743	CONGENITAL ABNORMALITIES OF THE EYE	RECONSTRUCTION OF THE EYELID WITH MUCOSAL GRAFT OR FLAP
743	CONGENITAL ABNORMALITIES OF THE EYE	REMOVAL OF IMPLANTED LENS
743	CONGENITAL ABNORMALITIES OF THE EYE	REMOVAL OF OCULAR PROSTHESIS

743	CONGENITAL ABNORMALITIES OF THE EYE	SPECILLATION OF THE NASOLACRIMAL DUCT
743	CONGENITAL ABNORMALITIES OF THE EYE	THERMOCAUTERIZATION OF THE SCLERA WITH IRIDECTOMY
743	CONGENITAL ABNORMALITIES OF THE EYE	EXTERNAL AB TRABECULECTOMY
743	CONGENITAL ABNORMALITIES OF THE EYE	EXTERNAL AB TRABECULECTOMY
743	CONGENITAL ABNORMALITIES OF THE EYE	DIATHERMIC TREATMENT OF CHORIORETINAL LESION
743	CONGENITAL ABNORMALITIES OF THE EYE	MECHANICAL VITRECTOMY , ANTERIOR VIA
743	CONGENITAL ABNORMALITIES OF THE EYE	ANTERIOR VITRECTOMY (LIMBAR)
744	CONGENITAL ABNORMALITIES OF THE EAR, FACE AND NECK	OTHER LOCAL REMOVAL OR DEMOLITION OF SKIN AND SUBCUTANEOUS LESION OR TISSUE
744	CONGENITAL ABNORMALITIES OF THE EAR, FACE AND NECK	OTHER PERMANENT TRACHEOSTOMY
744	CONGENITAL ABNORMALITIES OF THE EAR, FACE AND NECK	OTHER INTERVENTIONS ON THE PHARYNX
744	CONGENITAL ABNORMALITIES OF THE EAR, FACE AND NECK	OTHER SKIN GRAFTING ON OTHER LOCATIONS
744	CONGENITAL ABNORMALITIES OF THE EAR, FACE AND NECK	REMOVAL OF THE PRE-EAR SINUS
744	CONGENITAL ABNORMALITIES OF THE EAR, FACE AND NECK	REMOVAL OR DEMOLITION OF ANOTHER OUTER EAR INJURY
744	CONGENITAL ABNORMALITIES OF THE EAR, FACE AND NECK	RADICAL REMOVAL OF SKIN LESION
744	CONGENITAL ABNORMALITIES OF THE EAR, FACE AND NECK	CLOSURE OF SKIN AND SUBCUTANEOUS TISSUE, OTHER LOCATIONS
744	CONGENITAL ABNORMALITIES OF THE EAR, FACE AND NECK	PLASTIC INTERVENTION ON THE PHARYNX
744	CONGENITAL ABNORMALITIES OF THE EAR, FACE AND NECK	DERMAL APPENDIX LIGATION
744	CONGENITAL ABNORMALITIES OF THE EAR, FACE AND NECK	REMOVAL OF TYMPANOSTOMIC TUBE
744	CONGENITAL ABNORMALITIES OF THE EAR, FACE AND NECK	REPAIR OF FACIAL DEFECTS
744	CONGENITAL ABNORMALITIES OF THE EAR, FACE AND NECK	REPAIR OF CLEFT LIP
745	ABNORMALITIES OF THE HEART BULB AND ABNORMALITIES OF THE CLOSURE OF THE CARDIAC SEPTUM	ENLARGEMENT OF EXISTING DEFECT OF THE ATRIAL SEPTUM
745	ABNORMALITIES OF THE HEART BULB AND ABNORMALITIES OF THE CLOSURE OF THE CARDIAC SEPTUM	OTHER ANASTOMOSIS OR INTRATHORACIC VASCULAR BYPASS
745	ABNORMALITIES OF THE HEART BULB AND ABNORMALITIES OF THE CLOSURE OF THE CARDIAC SEPTUM	OTHER REMOVAL OF THE AORTA, ABDOMINAL
745	ABNORMALITIES OF THE HEART BULB AND ABNORMALITIES OF THE CLOSURE OF THE CARDIAC SEPTUM	OTHER REMOVAL OF OTHER THORACIC VESSELS
745	ABNORMALITIES OF THE HEART BULB AND ABNORMALITIES OF THE CLOSURE OF THE CARDIAC SEPTUM	OTHER AND UNSPECIFIED REPAIR OF DEFECT OF ENDOCARDIAL CUSHIONS
745	ABNORMALITIES OF THE HEART BULB AND ABNORMALITIES OF THE CLOSURE OF THE CARDIAC SEPTUM	OTHER AND UNSPECIFIED REPAIR OF INTERATRIAL SEPTAL DEFECT
745	ABNORMALITIES OF THE HEART BULB AND ABNORMALITIES OF THE CLOSURE OF THE CARDIAC SEPTUM	OTHER AND UNSPECIFIED REPAIR OF INTERVENTRICULAR SEPTAL DEFECT
745	ABNORMALITIES OF THE HEART BULB AND ABNORMALITIES OF THE CLOSURE OF THE CARDIAC SEPTUM	OTHER SURGICAL OCCLUSION OF OTHER THORACIC VESSELS
745	ABNORMALITIES OF THE HEART BULB AND ABNORMALITIES OF THE CLOSURE OF THE CARDIAC SEPTUM	OTHER REVISION OF VASCULAR INTERVENTIONS
745	ABNORMALITIES OF THE HEART BULB AND ABNORMALITIES OF THE CLOSURE OF THE CARDIAC SEPTUM	OTHER REPAIR OF VESSELS
745	ABNORMALITIES OF THE HEART BULB AND ABNORMALITIES OF THE CLOSURE OF THE CARDIAC SEPTUM	OTHER ENDOVASCULAR REPAIR OF GRAFT ANEURYSM
745	ABNORMALITIES OF THE HEART BULB AND ABNORMALITIES OF THE CLOSURE OF THE CARDIAC SEPTUM	OTHER MITRAL VALVE REPLACEMENT WITH PROSTHESIS
745	ABNORMALITIES OF THE HEART BULB AND ABNORMALITIES OF THE CLOSURE OF THE CARDIAC SEPTUM	OTHER REPLACEMENT OF PULMONARY VALVE WITH PROSTHESIS
745	ABNORMALITIES OF THE HEART BULB AND ABNORMALITIES OF THE CLOSURE OF THE CARDIAC SEPTUM	OTHER REPLACEMENT OF TRICUSPID VALVE WITH PROSTHESIS
745	ABNORMALITIES OF THE HEART BULB AND ABNORMALITIES OF THE CLOSURE OF THE CARDIAC SEPTUM	OTHER INTERVENTIONS ON THE SEPTA OF THE HEART
745	ABNORMALITIES OF THE HEART BULB AND ABNORMALITIES OF THE CLOSURE OF THE CARDIAC SEPTUM	OTHER INTERVENTIONS ON THE VESSELS
745	ABNORMALITIES OF THE HEART BULB AND ABNORMALITIES OF THE CLOSURE OF THE CARDIAC SEPTUM	OTHER INTERVENTIONS ON THE VESSELS OF THE HEART
745	ABNORMALITIES OF THE HEART BULB AND ABNORMALITIES OF THE CLOSURE OF THE CARDIAC SEPTUM	OTHER INTERVENTIONS ON THE VALVES OF THE HEART
745	ABNORMALITIES OF THE HEART BULB AND ABNORMALITIES OF THE CLOSURE OF THE CARDIAC SEPTUM	CAVA AND PULMONARY ARTERY ANASTOMOSIS
745	ABNORMALITIES OF THE HEART BULB AND ABNORMALITIES OF THE CLOSURE OF THE CARDIAC SEPTUM	PULMONARY SYSTEMIC ARTERIAL ANASTOMOSIS
745	ABNORMALITIES OF THE HEART BULB AND ABNORMALITIES OF THE CLOSURE OF THE CARDIAC SEPTUM	ANASTOMOSIS BETWEEN VENTRICLE, ABDOMINAL CAVITY AND ITS ORGANS
745	ABNORMALITIES OF THE HEART BULB AND ABNORMALITIES OF THE CLOSURE OF THE CARDIAC SEPTUM	ANGIOPLASTY OR ATHERECTOMY OF NON-CORONARY VESSEL
745	ABNORMALITIES OF THE HEART BULB AND ABNORMALITIES OF THE CLOSURE OF THE CARDIAC SEPTUM	REMOVAL BY CATHETER OF LESION OR TISSUE OF THE HEART
745	ABNORMALITIES OF THE HEART BULB AND ABNORMALITIES OF THE CLOSURE OF THE CARDIAC SEPTUM	REMOVAL OR DESTRUCTION OF OTHER LESION OR TISSUE OF THE HEART, OPEN APPROACH
745	ABNORMALITIES OF THE HEART BULB AND ABNORMALITIES OF THE CLOSURE OF THE CARDIAC SEPTUM	PERCUTANEOUS CARDIOPULMONARY BYPASS
745	ABNORMALITIES OF THE HEART BULB AND ABNORMALITIES OF THE CLOSURE OF THE CARDIAC SEPTUM	CARDIOPLEGIA
745	ABNORMALITIES OF THE HEART BULB AND ABNORMALITIES OF THE CLOSURE OF THE CARDIAC SEPTUM	CARDIOTOMY
745	ABNORMALITIES OF THE HEART BULB AND ABNORMALITIES OF THE CLOSURE OF THE CARDIAC SEPTUM	AUXILIARY EXTRACORPOREAL CIRCULATION FOR OPEN HEART SURGERY
745	ABNORMALITIES OF THE HEART BULB AND ABNORMALITIES OF THE CLOSURE OF THE CARDIAC SEPTUM	TOTAL CORRECTION OF THE ARTERIAL TRUNK
745	ABNORMALITIES OF THE HEART BULB AND ABNORMALITIES OF THE CLOSURE OF THE CARDIAC SEPTUM	TOTAL CORRECTION OF COMPLETE ABNORMALITY OF THE PULMONARY VENOUS CONNECTION
745	ABNORMALITIES OF THE HEART BULB AND ABNORMALITIES OF THE CLOSURE OF THE CARDIAC SEPTUM	TOTAL CORRECTION OF TETRALOGY OF FALLOT
745	ABNORMALITIES OF THE HEART BULB AND ABNORMALITIES OF THE CLOSURE OF THE CARDIAC SEPTUM	TOTAL CORRECTION OF TRANSPOSITION OF LARGE VASE NOT CLASSIFIED ELSEWHERE
745	ABNORMALITIES OF THE HEART BULB AND ABNORMALITIES OF THE CLOSURE OF THE CARDIAC SEPTUM	CREATION OF DUCT BETWEEN ATRIUM AND PULMONARY ARTERY
745	ABNORMALITIES OF THE HEART BULB AND ABNORMALITIES OF THE CLOSURE OF THE CARDIAC SEPTUM	CREATION OF DUCT BETWEEN LEFT VENTRICLE AND AORTA
745	ABNORMALITIES OF THE HEART BULB AND ABNORMALITIES OF THE CLOSURE OF THE CARDIAC SEPTUM	CREATION OF DUCT BETWEEN RIGHT VENTRICLE AND PULMONARY ARTERY
745	ABNORMALITIES OF THE HEART BULB AND ABNORMALITIES OF THE CLOSURE OF THE CARDIAC SEPTUM	CREATION OF SEPTAL DEFECT IN THE HEART
745	ABNORMALITIES OF THE HEART BULB AND ABNORMALITIES OF THE CLOSURE OF THE CARDIAC SEPTUM	HEART INCISION
745	ABNORMALITIES OF THE HEART BULB AND ABNORMALITIES OF THE CLOSURE OF THE CARDIAC SEPTUM	LUNG INCISION
745	ABNORMALITIES OF THE HEART BULB AND ABNORMALITIES OF THE CLOSURE OF THE CARDIAC SEPTUM	INFUNDIBULECTOMY
745	ABNORMALITIES OF THE HEART BULB AND ABNORMALITIES OF THE CLOSURE OF THE CARDIAC SEPTUM	INSERTION OF TWO VASCULAR STENTS
745	ABNORMALITIES OF THE HEART BULB AND ABNORMALITIES OF THE CLOSURE OF THE CARDIAC SEPTUM	INSERTION OF NON-MEDICATED STENT INTO THE CORONARY ARTERY
745	ABNORMALITIES OF THE HEART BULB AND ABNORMALITIES OF THE CLOSURE OF THE CARDIAC SEPTUM	INSERTION OF STENTS ON NON-CORONARY ARTERY
745	ABNORMALITIES OF THE HEART BULB AND ABNORMALITIES OF THE CLOSURE OF THE CARDIAC SEPTUM	INSERTION OF A VASCULAR STENT
745	ABNORMALITIES OF THE HEART BULB AND ABNORMALITIES OF THE CLOSURE OF THE CARDIAC SEPTUM	INITIAL INSERTION OF TRANSVENOUS ELECTRODES INTO THE ATRIUM AND VENTRICLE
745	ABNORMALITIES OF THE HEART BULB AND ABNORMALITIES OF THE CLOSURE OF THE CARDIAC SEPTUM	INTERVENTIONS ON OTHER STRUCTURES ADJACENT TO THE VALVES OF THE HEART
745	ABNORMALITIES OF THE HEART BULB AND ABNORMALITIES OF THE CLOSURE OF THE CARDIAC SEPTUM	INTERVENTIONS ON THE FLESHY TRABECULAE OF THE HEART
745	ABNORMALITIES OF THE HEART BULB AND ABNORMALITIES OF THE CLOSURE OF THE CARDIAC SEPTUM	INCIDENTAL (SYSTEMIC) HYPOTHERMIA FOR OPEN HEART SURGERY
745	ABNORMALITIES OF THE HEART BULB AND ABNORMALITIES OF THE CLOSURE OF THE CARDIAC SEPTUM	OPEN CHEST CARDIAC MASSAGE
745	ABNORMALITIES OF THE HEART BULB AND ABNORMALITIES OF THE CLOSURE OF THE CARDIAC SEPTUM	PERICARDIOCENTESIS
745	ABNORMALITIES OF THE HEART BULB AND ABNORMALITIES OF THE CLOSURE OF THE CARDIAC SEPTUM	PERICARDIOTOMY
745	ABNORMALITIES OF THE HEART BULB AND ABNORMALITIES OF THE CLOSURE OF THE CARDIAC SEPTUM	RESECTION OF THE AORTA WITH ANASTOMOSIS
745	ABNORMALITIES OF THE HEART BULB AND ABNORMALITIES OF THE CLOSURE OF THE CARDIAC SEPTUM	RESECTION OF OTHER THORACIC VESSELS WITH ANASTOMOSIS
745	ABNORMALITIES OF THE HEART BULB AND ABNORMALITIES OF THE CLOSURE OF THE CARDIAC SEPTUM	RESECTION OF OTHER THORACIC VESSELS WITH REPLACEMENT
745	ABNORMALITIES OF THE HEART BULB AND ABNORMALITIES OF THE CLOSURE OF THE CARDIAC SEPTUM	REVISION OF CORRECTIVE PROCEDURES OF THE HEART
745	ABNORMALITIES OF THE HEART BULB AND ABNORMALITIES OF THE CLOSURE OF THE CARDIAC SEPTUM	REPAIR WITH PROSTHESES OF ENDOCARDIAL CUSHION DEFECT
745	ABNORMALITIES OF THE HEART BULB AND ABNORMALITIES OF THE CLOSURE OF THE CARDIAC SEPTUM	REPAIR WITH PROSTHESIS OF INTERVENTRICULAR SEPTAL DEFECT
745	ABNORMALITIES OF THE HEART BULB AND ABNORMALITIES OF THE CLOSURE OF THE CARDIAC SEPTUM	REPAIR OF ENDOCARDIAL CUSHION DEFECT WITH TISSUE GRAFT

745	ABNORMALITIES OF THE HEART BULB AND ABNORMALITIES OF THE CLOSURE OF THE CARDIAC SEPTUM	REPAIR OF INTERATRIAL SEPTAL DEFECT WITH TISSUE GRAFT
745	ABNORMALITIES OF THE HEART BULB AND ABNORMALITIES OF THE CLOSURE OF THE CARDIAC SEPTUM	REPAIR OF INTERATRIAL SEPTAL DEFECT WITH PROSTHESIS, OPEN TECHNIQUE
745	ABNORMALITIES OF THE HEART BULB AND ABNORMALITIES OF THE CLOSURE OF THE CARDIAC SEPTUM	REPAIR OF INTERATRIAL SEPTAL DEFECT WITH DIRECT SUTURE
745	ABNORMALITIES OF THE HEART BULB AND ABNORMALITIES OF THE CLOSURE OF THE CARDIAC SEPTUM	REPAIR OF INTERVENTRICULAR SEPTAL DEFECT WITH TISSUE GRAFT
745	ABNORMALITIES OF THE HEART BULB AND ABNORMALITIES OF THE CLOSURE OF THE CARDIAC SEPTUM	REPAIR OF ARTERIOVENOUS FISTULA
745	ABNORMALITIES OF THE HEART BULB AND ABNORMALITIES OF THE CLOSURE OF THE CARDIAC SEPTUM	BLOOD VESSEL REPAIR WITH AUTOLOGOUS PATCH
745	ABNORMALITIES OF THE HEART BULB AND ABNORMALITIES OF THE CLOSURE OF THE CARDIAC SEPTUM	BLOOD VESSEL REPAIR WITH UNSPECIFIED PATCH TYPE
745	ABNORMALITIES OF THE HEART BULB AND ABNORMALITIES OF THE CLOSURE OF THE CARDIAC SEPTUM	HEART VALVE REPLACEMENT
745	ABNORMALITIES OF THE HEART BULB AND ABNORMALITIES OF THE CLOSURE OF THE CARDIAC SEPTUM	REPLACEMENT OF PULMONARY VALVE WITH BIOPROSTHESIS
745	ABNORMALITIES OF THE HEART BULB AND ABNORMALITIES OF THE CLOSURE OF THE CARDIAC SEPTUM	INTERATRIAL TRANSPOSITION OF VENOUS RETURN
745	ABNORMALITIES OF THE HEART BULB AND ABNORMALITIES OF THE CLOSURE OF THE CARDIAC SEPTUM	OPEN-HEART VALVULOPLASTY OF THE AORTIC VALVE WITHOUT REPLACEMENT
745	ABNORMALITIES OF THE HEART BULB AND ABNORMALITIES OF THE CLOSURE OF THE CARDIAC SEPTUM	MITRAL VALVE OPEN-HEART VALVULOPLASTY WITHOUT REPLACEMENT
745	ABNORMALITIES OF THE HEART BULB AND ABNORMALITIES OF THE CLOSURE OF THE CARDIAC SEPTUM	OPEN-HEART VALVULOPLASTY OF THE PULMONARY VALVE WITHOUT REPLACEMENT
745	ABNORMALITIES OF THE HEART BULB AND ABNORMALITIES OF THE CLOSURE OF THE CARDIAC SEPTUM	OPEN-HEART VALVULOPLASTY OF THE TRICUSPID VALVE WITHOUT REPLACEMENT
745	ABNORMALITIES OF THE HEART BULB AND ABNORMALITIES OF THE CLOSURE OF THE CARDIAC SEPTUM	OPEN HEART VALVULOPLASTY WITHOUT REPLACEMENT
745	ABNORMALITIES OF THE HEART BULB AND ABNORMALITIES OF THE CLOSURE OF THE CARDIAC SEPTUM	OPEN HEART VALVULOPLASTY WITHOUT REPLACEMENT, VALVE NOT SPECIFIED
745	ABNORMALITIES OF THE HEART BULB AND ABNORMALITIES OF THE CLOSURE OF THE CARDIAC SEPTUM	PERCUTANEOUS VALVULOPLASTY
745	ABNORMALITIES OF THE HEART BULB AND ABNORMALITIES OF THE CLOSURE OF THE CARDIAC SEPTUM	CLOSED-HEART VALVULOTOMY, PULMONARY VALVE
746	OTHER CONGENITAL ABNORMALITIES OF THE HEART	ENLARGEMENT EXISTING ATRIAL SEPTAL DEFECT
746	OTHER CONGENITAL ABNORMALITIES OF THE HEART	OTHER ANASTOMOSIS OR INTRATHORACIC VASCULAR BYPASS
746	OTHER CONGENITAL ABNORMALITIES OF THE HEART	OTHER REMOVAL OF OTHER THORACIC VESSELS
746	OTHER CONGENITAL ABNORMALITIES OF THE HEART	OTHER LOCAL REMOVAL OR DEMOLITION OF LUNG INJURY OR TISSUE
746	OTHER CONGENITAL ABNORMALITIES OF THE HEART	OTHER AND UNSPECIFIED REPAIR OF INTERATRIAL SEPTAL DEFECT
746	OTHER CONGENITAL ABNORMALITIES OF THE HEART	OTHER INCISION OF THE PLEURA
746	OTHER CONGENITAL ABNORMALITIES OF THE HEART	OTHER SURGICAL OCCLUSION OF OTHER THORACIC VESSELS
746	OTHER CONGENITAL ABNORMALITIES OF THE HEART	OTHER SURGICAL OCCLUSION OF VESSELS, LOCATION NOT SPECIFIED
746	OTHER CONGENITAL ABNORMALITIES OF THE HEART	OTHER REVISION OF VASCULAR INTERVENTIONS
746	OTHER CONGENITAL ABNORMALITIES OF THE HEART	OTHER REMOVAL OF CORONARY ARTERY OBSTRUCTION
746	OTHER CONGENITAL ABNORMALITIES OF THE HEART	OTHER REPAIR OF ANEURYSMS
746	OTHER CONGENITAL ABNORMALITIES OF THE HEART	OTHER REPAIR OF VASES
746	OTHER CONGENITAL ABNORMALITIES OF THE HEART	OTHER ENDOVASCULAR REPAIR OF GRAFT ANEURYSM
746	OTHER CONGENITAL ABNORMALITIES OF THE HEART	OTHER REPLACEMENT OF AORTIC VALVE WITH PROSTHESIS
746	OTHER CONGENITAL ABNORMALITIES OF THE HEART	OTHER MITRAL VALVE REPLACEMENT WITH PROSTHESIS
746	OTHER CONGENITAL ABNORMALITIES OF THE HEART	OTHER REPLACEMENT OF PULMONARY VALVE WITH PROSTHESIS
746	OTHER CONGENITAL ABNORMALITIES OF THE HEART	OTHER REPLACEMENT OF TRICUSPID VALVE WITH PROSTHESIS
746	OTHER CONGENITAL ABNORMALITIES OF THE HEART	OTHER PERMANENT TRACHEOSTOMY
746	OTHER CONGENITAL ABNORMALITIES OF THE HEART	OTHER INTERVENTIONS ON THE SEPTA OF THE HEART
746	OTHER CONGENITAL ABNORMALITIES OF THE HEART	OTHER INTERVENTIONS ON THE VESSELS OF THE HEART
746	OTHER CONGENITAL ABNORMALITIES OF THE HEART	CAVA AND PULMONARY ARTERY ANASTOMOSIS
746	OTHER CONGENITAL ABNORMALITIES OF THE HEART	PULMONARY SYSTEMIC ARTERIAL ANASTOMOSIS
746	OTHER CONGENITAL ABNORMALITIES OF THE HEART	ANASTOMOSIS BETWEEN VENTRICLE, ABDOMINAL CAVITY AND ITS ORGANS
746	OTHER CONGENITAL ABNORMALITIES OF THE HEART	SINGLE VESSEL TRANSLUMINAL PERCUTANEOUS CORONARY ANGIOPLASTY (PTCA) OR CORONARY ARTERECTOMY WITH
746	OTHER CONGENITAL ABNORMALITIES OF THE HEART	ANGIOPLASTY OR ATHERECTOMY OF NON-CORONARY VESSEL
746	OTHER CONGENITAL ABNORMALITIES OF THE HEART	REMOVAL BY CATHETER OF LESION OR TISSUE OF THE HEART
746	OTHER CONGENITAL ABNORMALITIES OF THE HEART	PERCUTANEOUS CARDIOPULMONARY BYPASS
746	OTHER CONGENITAL ABNORMALITIES OF THE HEART	CARDIOPLEGIA
746	OTHER CONGENITAL ABNORMALITIES OF THE HEART	CARDIOTOMY
746	OTHER CONGENITAL ABNORMALITIES OF THE HEART	AUXILIARY EXTRACORPOREAL CIRCULATION FOR OPEN HEART SURGERY
746	OTHER CONGENITAL ABNORMALITIES OF THE HEART	TOTAL CORRECTION OF THE ARTERIAL TRUNK
746	OTHER CONGENITAL ABNORMALITIES OF THE HEART	TOTAL CORRECTION OF COMPLETE ABNORMALITY OF THE PULMONARY VENOUS CONNECTION
746	OTHER CONGENITAL ABNORMALITIES OF THE HEART	TOTAL CORRECTION OF TETRALOGY OF FALLOT
746	OTHER CONGENITAL ABNORMALITIES OF THE HEART	TOTAL CORRECTION OF TRANSPOSITION OF LARGE VESSELS NOT CLASSIFIED ELSEWHERE
746	OTHER CONGENITAL ABNORMALITIES OF THE HEART	CREATION OF DUCT BETWEEN ATRIUM AND PULMONARY ARTERY
746	OTHER CONGENITAL ABNORMALITIES OF THE HEART	CREATION OF DUCT BETWEEN THE LEFT VENTRICLE AND THE AORTA
746	OTHER CONGENITAL ABNORMALITIES OF THE HEART	CREATION OF DUCT BETWEEN RIGHT VENTRICLE AND PULMONARY ARTERY
746	OTHER CONGENITAL ABNORMALITIES OF THE HEART	CREATION OF SEPTAL DEFECT IN THE HEART
746	OTHER CONGENITAL ABNORMALITIES OF THE HEART	ENDOARTERIECTOMY OF THE AORTA
746	OTHER CONGENITAL ABNORMALITIES OF THE HEART	HEART INCISION NOS
746	OTHER CONGENITAL ABNORMALITIES OF THE HEART	INFUNDIBULECTOMY
746	OTHER CONGENITAL ABNORMALITIES OF THE HEART	INSERTION OF INTERCOSTAL DRAINAGE
746	OTHER CONGENITAL ABNORMALITIES OF THE HEART	INSERTION OF NON-MEDICATED STENT INTO THE CORONARY ARTERY
746	OTHER CONGENITAL ABNORMALITIES OF THE HEART	INSERTION OF STENTS ON NON-CORONARY ARTERY
746	OTHER CONGENITAL ABNORMALITIES OF THE HEART	INSERTION OF A VASCULAR STENT
746	OTHER CONGENITAL ABNORMALITIES OF THE HEART	INTERVENTIONS ON OTHER STRUCTURES ADJACENT TO THE VALVES OF THE HEART
746	OTHER CONGENITAL ABNORMALITIES OF THE HEART	SURGERY ON TENDON CORDS
746	OTHER CONGENITAL ABNORMALITIES OF THE HEART	INTERVENTIONS ON THE FLESHY TRABECULAE OF THE HEART
746	OTHER CONGENITAL ABNORMALITIES OF THE HEART	INCIDENTAL (SYSTEMIC) HYPOTHERMIA FOR OPEN HEART SURGERY
746	OTHER CONGENITAL ABNORMALITIES OF THE HEART	OPEN CHEST CARDIAC MASSAGE
746	OTHER CONGENITAL ABNORMALITIES OF THE HEART	EXTRACORPOREAL OXYGENATION OF MEMBRANES (ECMO)
746	OTHER CONGENITAL ABNORMALITIES OF THE HEART	PERICARDIOCENTESIS
746	OTHER CONGENITAL ABNORMALITIES OF THE HEART	PROCEDURES ON A SINGLE VESSEL
746	OTHER CONGENITAL ABNORMALITIES OF THE HEART	RESECTION OF THE AORTA WITH ANASTOMOSIS
746	OTHER CONGENITAL ABNORMALITIES OF THE HEART	RESECTION OF THE AORTA, ABDOMINAL WITH REPLACEMENT
746	OTHER CONGENITAL ABNORMALITIES OF THE HEART	RESECTION OF OTHER THORACIC VESSELS WITH ANASTOMOSIS
746	OTHER CONGENITAL ABNORMALITIES OF THE HEART	RESECTION OF OTHER THORACIC VESSELS WITH REPLACEMENT
746	OTHER CONGENITAL ABNORMALITIES OF THE HEART	REVISION OF CORRECTIVE PROCEDURES OF THE HEART
746	OTHER CONGENITAL ABNORMALITIES OF THE HEART	REPAIR WITH DEFECT PROSTHESES OF ENDOCARDIAL CUSHIONS

746	OTHER CONGENITAL ABNORMALITIES OF THE HEART	REPAIR WITH INTERVENTRICULAR SEPTAL DEFECT PROSTHESIS
746	OTHER CONGENITAL ABNORMALITIES OF THE HEART	DEFECT REPAIR OF ENDOCARDIAL CUSHIONS WITH TISSUE GRAFT
746	OTHER CONGENITAL ABNORMALITIES OF THE HEART	REPAIR OF INTERATRIAL SEPTAL DEFECT WITH TISSUE GRAFT
746	OTHER CONGENITAL ABNORMALITIES OF THE HEART	REPAIR OF INTERATRIAL SEPTAL DEFECT WITH PROSTHESIS, OPEN TECHNIQUE
746	OTHER CONGENITAL ABNORMALITIES OF THE HEART	REPAIR OF INTERATRIAL SEPTAL DEFECT WITH DIRECT SUTURE
746	OTHER CONGENITAL ABNORMALITIES OF THE HEART	REPAIR OF INTERVENTRICULAR SEPTAL DEFECT WITH TISSUE GRAFT
746	OTHER CONGENITAL ABNORMALITIES OF THE HEART	REPAIR OF UNSPECIFIED SEPTAL DEFECT OF THE HEART WITH PROSTHESIS
746	OTHER CONGENITAL ABNORMALITIES OF THE HEART	BLOOD VESSEL REPAIR WITH UNSPECIFIED PATCH TYPE
746	OTHER CONGENITAL ABNORMALITIES OF THE HEART	REPLACEMENT OF THE AORTIC VALVE WITH BIOPROSTHESIS
746	OTHER CONGENITAL ABNORMALITIES OF THE HEART	MITRAL VALVE REPLACEMENT WITH BIOPROSTHESIS
746	OTHER CONGENITAL ABNORMALITIES OF THE HEART	REPLACEMENT OF PULMONARY VALVE WITH BIOPROSTHESIS
746	OTHER CONGENITAL ABNORMALITIES OF THE HEART	THORACENTESIS
746	OTHER CONGENITAL ABNORMALITIES OF THE HEART	INTERATRIAL TRANSPOSITION OF VENOUS RETURN
746	OTHER CONGENITAL ABNORMALITIES OF THE HEART	OPEN-HEART VALVULOPLASTY OF THE AORTIC VALVE WITHOUT REPLACEMENT
746	OTHER CONGENITAL ABNORMALITIES OF THE HEART	MITRAL VALVE OPEN-HEART VALVULOPLASTY WITHOUT REPLACEMENT
746	OTHER CONGENITAL ABNORMALITIES OF THE HEART	OPEN-HEART VALVULOPLASTY OF THE PULMONARY VALVE WITHOUT REPLACEMENT
746	OTHER CONGENITAL ABNORMALITIES OF THE HEART	OPEN-HEART VALVULOPLASTY OF THE TRICUSPID VALVE WITHOUT REPLACEMENT
747	OTHER CONGENITAL ABNORMALITIES OF THE HEART	PERCUTANEOUS VALVULOPLASTY
747	OTHER CONGENITAL ABNORMALITIES OF THE HEART	CLOSED-HEART VALVULOTOMY, PULMONARY VALVE
747	OTHER CONGENITAL ABNORMALITIES OF THE HEART	CLOSED-HEART VALVULOTOMY, TRICUSPID VALVE
747	OTHER CONGENITAL ABNORMALITIES OF THE CIRCULATORY SYSTEM	ENLARGEMENT OF EXISTING DEFECT OF THE ATRIAL SEPTUM
747	OTHER CONGENITAL ABNORMALITIES OF THE CIRCULATORY SYSTEM	OTHER ANASTOMOSIS OR INTRATHORACIC VASCULAR BYPASS
747	OTHER CONGENITAL ABNORMALITIES OF THE CIRCULATORY SYSTEM	OTHER REMOVAL OF THE AORTA, ABDOMINAL
747	OTHER CONGENITAL ABNORMALITIES OF THE CIRCULATORY SYSTEM	OTHER REMOVAL OF OTHER THORACIC VESSELS
747	OTHER CONGENITAL ABNORMALITIES OF THE CIRCULATORY SYSTEM	OTHER LOCAL REMOVAL OR DEMOLITION OF LUNG INJURY OR TISSUE
747	OTHER CONGENITAL ABNORMALITIES OF THE CIRCULATORY SYSTEM	OTHER AND UNSPECIFIED REPAIR OF DEFECT OF ENDOCARDIAL CUSHIONS
747	OTHER CONGENITAL ABNORMALITIES OF THE CIRCULATORY SYSTEM	OTHER AND UNSPECIFIED REPAIR OF INTERATRIAL SEPTAL DEFECT
747	OTHER CONGENITAL ABNORMALITIES OF THE CIRCULATORY SYSTEM	OTHER SURGICAL OCCLUSION OF THE AORTA, ABDOMINAL
747	OTHER CONGENITAL ABNORMALITIES OF THE CIRCULATORY SYSTEM	OTHER SURGICAL OCCLUSION OF OTHER THORACIC VESSELS
747	OTHER CONGENITAL ABNORMALITIES OF THE CIRCULATORY SYSTEM	OTHER SURGICAL OCCLUSION OF INTRACRANIAL VESSELS
747	OTHER CONGENITAL ABNORMALITIES OF THE CIRCULATORY SYSTEM	OTHER SURGICAL OCCLUSION OF VESSELS, LOCATION NOT SPECIFIED
747	OTHER CONGENITAL ABNORMALITIES OF THE CIRCULATORY SYSTEM	OTHER REVISION OF VASCULAR INTERVENTIONS
747	OTHER CONGENITAL ABNORMALITIES OF THE CIRCULATORY SYSTEM	OTHER ENDOVASCULAR REPAIR OF GRAFT ANEURYSM
747	OTHER CONGENITAL ABNORMALITIES OF THE CIRCULATORY SYSTEM	OTHER INTERVENTIONS FOR VENTRICULAR DRAINAGE
747	OTHER CONGENITAL ABNORMALITIES OF THE CIRCULATORY SYSTEM	OTHER INTERVENTIONS ON VALVES AND SEPTA OF THE HEART
747	OTHER CONGENITAL ABNORMALITIES OF THE CIRCULATORY SYSTEM	OTHER INTERVENTIONS ON THE SEPTA OF THE HEART
747	OTHER CONGENITAL ABNORMALITIES OF THE CIRCULATORY SYSTEM	OTHER INTERVENTIONS ON THE VESSELS
747	OTHER CONGENITAL ABNORMALITIES OF THE CIRCULATORY SYSTEM	OTHER INTERVENTIONS ON THE VESSELS OF THE HEART
747	OTHER CONGENITAL ABNORMALITIES OF THE CIRCULATORY SYSTEM	OTHER INTERVENTIONS ON THE VALVES OF THE HEART
747	OTHER CONGENITAL ABNORMALITIES OF THE CIRCULATORY SYSTEM	OTHER BYPASS FOR CARDIAC REVASCULARIZATION
747	OTHER CONGENITAL ABNORMALITIES OF THE CIRCULATORY SYSTEM	CAVA AND PULMONARY ARTERY ANASTOMOSIS
747	OTHER CONGENITAL ABNORMALITIES OF THE CIRCULATORY SYSTEM	PULMONARY SYSTEMIC ARTERIAL ANASTOMOSIS
747	OTHER CONGENITAL ABNORMALITIES OF THE CIRCULATORY SYSTEM	ANASTOMOSIS BETWEEN VENTRICLE, ABDOMINAL CAVITY AND ITS ORGANS
747	OTHER CONGENITAL ABNORMALITIES OF THE CIRCULATORY SYSTEM	ANGIOPLASTY OR ATHERECTOMY OF NON-CORONARY VESSEL
747	OTHER CONGENITAL ABNORMALITIES OF THE CIRCULATORY SYSTEM	CARDIOPLEGIA
747	OTHER CONGENITAL ABNORMALITIES OF THE CIRCULATORY SYSTEM	CARDIOTOMY
747	OTHER CONGENITAL ABNORMALITIES OF THE CIRCULATORY SYSTEM	AUXILIARY EXTRACORPOREAL CIRCULATION FOR OPEN HEART SURGERY
747	OTHER CONGENITAL ABNORMALITIES OF THE CIRCULATORY SYSTEM	TOTAL CORRECTION OF THE ARTERIAL TRUNK
747	OTHER CONGENITAL ABNORMALITIES OF THE CIRCULATORY SYSTEM	TOTAL CORRECTION OF COMPLETE ABNORMALITY OF THE PULMONARY VENOUS CONNECTION
747	OTHER CONGENITAL ABNORMALITIES OF THE CIRCULATORY SYSTEM	TOTAL CORRECTION OF TETRALOGY OF FALLOT
747	OTHER CONGENITAL ABNORMALITIES OF THE CIRCULATORY SYSTEM	TOTAL CORRECTION OF TRANSPOSITION OF LARGE VASE NOT CLASSIFIED ELSEWHERE
747	OTHER CONGENITAL ABNORMALITIES OF THE CIRCULATORY SYSTEM	CREATION OF DUCT BETWEEN ATRIUM AND PULMONARY ARTERY
747	OTHER CONGENITAL ABNORMALITIES OF THE CIRCULATORY SYSTEM	CREATION OF DUCT BETWEEN THE LEFT VENTRICLE AND THE AORTA
747	OTHER CONGENITAL ABNORMALITIES OF THE CIRCULATORY SYSTEM	CREATION OF DUCT BETWEEN RIGHT VENTRICLE AND PULMONARY ARTERY
747	OTHER CONGENITAL ABNORMALITIES OF THE CIRCULATORY SYSTEM	CREATION OF SEPTAL DEFECT IN THE HEART
747	OTHER CONGENITAL ABNORMALITIES OF THE CIRCULATORY SYSTEM	ENDOARTERIECTOMY OF THE AORTA
747	OTHER CONGENITAL ABNORMALITIES OF THE CIRCULATORY SYSTEM	HEART INCISION NOS
747	OTHER CONGENITAL ABNORMALITIES OF THE CIRCULATORY SYSTEM	LUNG INCISION
747	OTHER CONGENITAL ABNORMALITIES OF THE CIRCULATORY SYSTEM	INCISION OF THE AORTA
747	OTHER CONGENITAL ABNORMALITIES OF THE CIRCULATORY SYSTEM	INCISION OF OTHER THORACIC VESSELS
747	OTHER CONGENITAL ABNORMALITIES OF THE CIRCULATORY SYSTEM	INFUNDIBULECTOMIA
747	OTHER CONGENITAL ABNORMALITIES OF THE CIRCULATORY SYSTEM	INSERTION OF TWO VASCULAR STENTS
747	OTHER CONGENITAL ABNORMALITIES OF THE CIRCULATORY SYSTEM	INSERTION OF STENTS ON NON-CORONARY ARTERY
747	OTHER CONGENITAL ABNORMALITIES OF THE CIRCULATORY SYSTEM	INSERTION OF A VASCULAR STENT
747	OTHER CONGENITAL ABNORMALITIES OF THE CIRCULATORY SYSTEM	INITIAL INSERTION OF TRANSVENOUS ELECTRODES INTO THE ATRIUM AND VENTRICLE
747	OTHER CONGENITAL ABNORMALITIES OF THE CIRCULATORY SYSTEM	INTERVENTIONS ON OTHER STRUCTURES ADJACENT TO THE VALVES OF THE HEART
747	OTHER CONGENITAL ABNORMALITIES OF THE CIRCULATORY SYSTEM	INTERVENTIONS ON THE FLESHY TRABECULAE OF THE HEART
747	OTHER CONGENITAL ABNORMALITIES OF THE CIRCULATORY SYSTEM	INCIDENTAL (SYSTEMIC) HYPOTHERMIA FOR OPEN HEART SURGERY
747	OTHER CONGENITAL ABNORMALITIES OF THE CIRCULATORY SYSTEM	LOBECTOMY OF THE LUNG
747	OTHER CONGENITAL ABNORMALITIES OF THE CIRCULATORY SYSTEM	OPEN CHEST CARDIAC MASSAGE
747	OTHER CONGENITAL ABNORMALITIES OF THE CIRCULATORY SYSTEM	EXTRACORPOREAL OXYGENATION OF MEMBRANES (ECMO)
747	OTHER CONGENITAL ABNORMALITIES OF THE CIRCULATORY SYSTEM	PERICARDIOTOMY
747	OTHER CONGENITAL ABNORMALITIES OF THE CIRCULATORY SYSTEM	PILOROMIOTOMY
747	OTHER CONGENITAL ABNORMALITIES OF THE CIRCULATORY SYSTEM	PROCEDURES ON THE BIFURCATION OF VESSELS
747	OTHER CONGENITAL ABNORMALITIES OF THE CIRCULATORY SYSTEM	RESECTION OF THE AORTA WITH ANASTOMOSIS
747	OTHER CONGENITAL ABNORMALITIES OF THE CIRCULATORY SYSTEM	RESECTION OF OTHER VESSELS OF THE HEAD AND NECK WITH ANASTOMOSIS
747	OTHER CONGENITAL ABNORMALITIES OF THE CIRCULATORY SYSTEM	RESECTION OF OTHER THORACIC VESSELS WITH ANASTOMOSIS

747	OTHER CONGENITAL ABNORMALITIES OF THE CIRCULATORY SYSTEM	RESECTION OF OTHER THORACIC VESSELS WITH REPLACEMENT
747	OTHER CONGENITAL ABNORMALITIES OF THE CIRCULATORY SYSTEM	SEGMENTAL RESECTION OF THE LUNG
747	OTHER CONGENITAL ABNORMALITIES OF THE CIRCULATORY SYSTEM	REVISION OF CORRECTIVE PROCEDURES OF THE HEART
747	OTHER CONGENITAL ABNORMALITIES OF THE CIRCULATORY SYSTEM	REPAIR WITH DEFECT PROSTHESES OF ENDOCARDIAL CUSHIONS
747	OTHER CONGENITAL ABNORMALITIES OF THE CIRCULATORY SYSTEM	REPAIR WITH INTERVENTRICULAR SEPTAL DEFECT PROSTHESIS
747	OTHER CONGENITAL ABNORMALITIES OF THE CIRCULATORY SYSTEM	REPAIR OF ENDOCARDIAL CUSHION DEFECT WITH TISSUE GRAFT
747	OTHER CONGENITAL ABNORMALITIES OF THE CIRCULATORY SYSTEM	REPAIR OF INTERATRIAL SEPTAL DEFECT WITH TISSUE GRAFT
747	OTHER CONGENITAL ABNORMALITIES OF THE CIRCULATORY SYSTEM	REPAIR OF INTERATRIAL SEPTAL DEFECT WITH PROSTHESIS, OPEN TECHNIQUE
747	OTHER CONGENITAL ABNORMALITIES OF THE CIRCULATORY SYSTEM	REPAIR OF INTERATRIAL SEPTAL DEFECT WITH DIRECT SUTURE
747	OTHER CONGENITAL ABNORMALITIES OF THE CIRCULATORY SYSTEM	REPAIR OF INTERVENTRICULAR SEPTAL DEFECT WITH TISSUE GRAFT
747	OTHER CONGENITAL ABNORMALITIES OF THE CIRCULATORY SYSTEM	REPAIR OF UNSPECIFIED SEPTAL DEFECT OF THE HEART WITH PROSTHESIS
747	OTHER CONGENITAL ABNORMALITIES OF THE CIRCULATORY SYSTEM	REPAIR OF ARTERIOVENOUS FISTULA
747	OTHER CONGENITAL ABNORMALITIES OF THE CIRCULATORY SYSTEM	BLOOD VESSEL REPAIR WITH AUTOLOGOUS PATCH
747	OTHER CONGENITAL ABNORMALITIES OF THE CIRCULATORY SYSTEM	BLOOD VESSEL REPAIR WITH UNSPECIFIED PATCH TYPE
747	OTHER CONGENITAL ABNORMALITIES OF THE CIRCULATORY SYSTEM	REPLACEMENT OF PULMONARY VALVE WITH BIOPROSTHESIS
747	OTHER CONGENITAL ABNORMALITIES OF THE CIRCULATORY SYSTEM	THORACENTESIS
747	OTHER CONGENITAL ABNORMALITIES OF THE CIRCULATORY SYSTEM	INTERATRIAL TRANSPOSITION OF VENOUS RETURN
747	OTHER CONGENITAL ABNORMALITIES OF THE CIRCULATORY SYSTEM	OPEN-HEART VALVULOPLASTY OF THE AORTIC VALVE WITHOUT REPLACEMENT
748	OTHER CONGENITAL ABNORMALITIES OF THE CIRCULATORY SYSTEM	MITRAL VALVE OPEN-HEART VALVULOPLASTY WITHOUT REPLACEMENT
748	OTHER CONGENITAL ABNORMALITIES OF THE CIRCULATORY SYSTEM	OPEN-HEART VALVULOPLASTY OF THE PULMONARY VALVE WITHOUT REPLACEMENT
748	OTHER CONGENITAL ABNORMALITIES OF THE CIRCULATORY SYSTEM	OPEN-HEART VALVULOPLASTY OF THE TRICUSPID VALVE WITHOUT REPLACEMENT
748	OTHER CONGENITAL ABNORMALITIES OF THE CIRCULATORY SYSTEM	OPEN HEART VALVULOPLASTY WITHOUT REPLACEMENT
748	OTHER CONGENITAL ABNORMALITIES OF THE CIRCULATORY SYSTEM	PERCUTANEOUS VALVULOPLASTY
748	OTHER CONGENITAL ABNORMALITIES OF THE CIRCULATORY SYSTEM	CLOSED-HEART VALVULOTOMY, PULMONARY VALVE
748	OTHER CONGENITAL ABNORMALITIES OF THE CIRCULATORY SYSTEM	CLOSED-HEART VALVULOTOMY, TRICUSPID VALVE
748	CONGENITAL ANOMALIES OF THE RESPIRATORY SYSTEM	THORACOSCOPIC ABLATION OF INJURY OR LUNG TISSUE
748	CONGENITAL ANOMALIES OF THE RESPIRATORY SYSTEM	OTHER LUNG REMOVAL
748	CONGENITAL ANOMALIES OF THE RESPIRATORY SYSTEM	OTHER REMOVAL OR DEMOLITION OF LESION OR TISSUE OF THE LARYNX
748	CONGENITAL ANOMALIES OF THE RESPIRATORY SYSTEM	OTHER LOCAL REMOVAL OR DEMOLITION OF LESION OR TISSUE OF THE BRONCHI
748	CONGENITAL ANOMALIES OF THE RESPIRATORY SYSTEM	OTHER LOCAL REMOVAL OR DEMOLITION OF LUNG INJURY OR TISSUE
748	CONGENITAL ANOMALIES OF THE RESPIRATORY SYSTEM	OTHER INCISION OF LARYNX OR TRACHEA
748	CONGENITAL ANOMALIES OF THE RESPIRATORY SYSTEM	OTHER SURGICAL OCCLUSION OF OTHER THORACIC VESSELS
748	CONGENITAL ANOMALIES OF THE RESPIRATORY SYSTEM	OTHER REPAIR OF THE LARYNX
748	CONGENITAL ANOMALIES OF THE RESPIRATORY SYSTEM	OTHER PERMANENT TRACHEOSTOMY
748	CONGENITAL ANOMALIES OF THE RESPIRATORY SYSTEM	OTHER REPAIRS AND PLASTIC OF THE NOSE
748	CONGENITAL ANOMALIES OF THE RESPIRATORY SYSTEM	OTHER REPAIRS AND PLASTIC SURGERY ON THE TRACHEA
748	CONGENITAL ANOMALIES OF THE RESPIRATORY SYSTEM	OTHER INTERVENTIONS FOR THE CREATION OF ESOPHAGOGASTRIC SPHINCTER
748	CONGENITAL ANOMALIES OF THE RESPIRATORY SYSTEM	OTHER INTERVENTIONS ON THE NOSE
748	CONGENITAL ANOMALIES OF THE RESPIRATORY SYSTEM	OTHER LUNG SURGERIES
748	CONGENITAL ANOMALIES OF THE RESPIRATORY SYSTEM	OTHER INTERVENTIONS ON THE LARYNX
748	CONGENITAL ANOMALIES OF THE RESPIRATORY SYSTEM	PULMONARY SYSTEMIC ARTERIAL ANASTOMOSIS
748	CONGENITAL ANOMALIES OF THE RESPIRATORY SYSTEM	LOCAL REMOVAL OF OTHER LESION OR TISSUE OF THE ESOPHAGUS
748	CONGENITAL ANOMALIES OF THE RESPIRATORY SYSTEM	REMOVAL OR DEMOLITION OF NOSE INJURY, SAI
748	CONGENITAL ANOMALIES OF THE RESPIRATORY SYSTEM	REMOVAL OR DEMOLITION OF LESION OR TISSUE OF THE PHARYNX
748	CONGENITAL ANOMALIES OF THE RESPIRATORY SYSTEM	LOCAL REMOVAL OR DEMOLITION OF ANOTHER NOSE INJURY
748	CONGENITAL ANOMALIES OF THE RESPIRATORY SYSTEM	LOCAL REMOVAL OR DEMOLITION OF BONE PALATE OR LESION
748	CONGENITAL ANOMALIES OF THE RESPIRATORY SYSTEM	LOCAL REMOVAL OR DEMOLITION OF TRACHEA LESION OR TISSUE
748	CONGENITAL ANOMALIES OF THE RESPIRATORY SYSTEM	CLOSURE OF ANOTHER FISTULA OF THE TRACHEA
748	CONGENITAL ANOMALIES OF THE RESPIRATORY SYSTEM	CLOSURE OF BRACHIAL FISTULA
748	CONGENITAL ANOMALIES OF THE RESPIRATORY SYSTEM	CLOSURE OF EXTERNAL FISTULA OF THE TRACHEA
748	CONGENITAL ANOMALIES OF THE RESPIRATORY SYSTEM	CLEFT PALATE CORRECTION
748	CONGENITAL ANOMALIES OF THE RESPIRATORY SYSTEM	TOTAL CORRECTION OF TRANSPOSITION OF LARGE VESSELS NOT CLASSIFIED ELSEWHERE
748	CONGENITAL ANOMALIES OF THE RESPIRATORY SYSTEM	DILATION OF THE PHARYNX
748	CONGENITAL ANOMALIES OF THE RESPIRATORY SYSTEM	DILATION OF THE ESOPHAGUS
748	CONGENITAL ANOMALIES OF THE RESPIRATORY SYSTEM	INTRATHORACIC ESOPHAGOUS ESOPHAGOTOMY
748	CONGENITAL ANOMALIES OF THE RESPIRATORY SYSTEM	PHARYNGECTOMY (PARTIAL)
748	CONGENITAL ANOMALIES OF THE RESPIRATORY SYSTEM	FRACTURE OF TURBINATES
748	CONGENITAL ANOMALIES OF THE RESPIRATORY SYSTEM	INTERVENTIONS ON OTHER STRUCTURES ADJACENT TO THE VALVES OF THE HEART
748	CONGENITAL ANOMALIES OF THE RESPIRATORY SYSTEM	PLASTIC INTERVENTION ON THE PHARYNX
749	CONGENITAL ANOMALIES OF THE RESPIRATORY SYSTEM	LYSIS OF ADHESIONS OF THE NOSE
749	CONGENITAL ANOMALIES OF THE RESPIRATORY SYSTEM	LOBECTOMY OF THE LUNG
749	CONGENITAL ANOMALIES OF THE RESPIRATORY SYSTEM	SEGMENTAL RESECTION OF THE LUNG
749	CONGENITAL ANOMALIES OF THE RESPIRATORY SYSTEM	SUBMUCOSAL RESECTION OF THE NASAL SEPTUM
749	CONGENITAL ANOMALIES OF THE RESPIRATORY SYSTEM	REVISION OF TRACHEOSTOMY
749	CONGENITAL ANOMALIES OF THE RESPIRATORY SYSTEM	REPAIR OF DIAPHRAGMATIC HERNIA, ABDOMINAL
749	CONGENITAL ANOMALIES OF THE RESPIRATORY SYSTEM	REPAIR OF CLEFT LIP
749	CONGENITAL ANOMALIES OF THE RESPIRATORY SYSTEM	LACERATION SUTURE OF THE PALATE
749	CONGENITAL ANOMALIES OF THE RESPIRATORY SYSTEM	THORACENTESIS
749	CONGENITAL ANOMALIES OF THE RESPIRATORY SYSTEM	EXPLORATORY THORACOTOMY
749	CONGENITAL ANOMALIES OF THE RESPIRATORY SYSTEM	TEMPORARY TRACHEOSTOMY
749	CONGENITAL ANOMALIES OF THE RESPIRATORY SYSTEM	OPEN-HEART VALVULOPLASTY OF THE PULMONARY VALVE WITHOUT REPLACEMENT
749	CLEFT PALATE AND CLEFT LIP	OTHER REMOVAL OF LIP INJURY OR TISSUE
749	CLEFT PALATE AND CLEFT LIP	OTHER ORTHOGNATHIC SURGERY OF THE JAW
749	CLEFT PALATE AND CLEFT LIP	OTHER SEPTAL PLASTIC
749	CLEFT PALATE AND CLEFT LIP	OTHER RHINOPLASTY
749	CLEFT PALATE AND CLEFT LIP	OTHER REPAIR OR RECONSTRUCTION OF SKIN AND SUBCUTANEOUS TISSUE
749	CLEFT PALATE AND CLEFT LIP	OTHER PLASTIC REPAIR OF THE PALATE

749	CLEFT PALATE AND CLEFT LIP	OTHER PLASTIC REPAIR OF THE MOUTH
749	CLEFT PALATE AND CLEFT LIP	OTHER PERMANENT TRACHEOSTOMY
749	CLEFT PALATE AND CLEFT LIP	OTHER REPAIRS AND PLASTIC ON THE TONGUE
749	CLEFT PALATE AND CLEFT LIP	OTHER INTERVENTIONS ON ORAL CAVITY
749	CLEFT PALATE AND CLEFT LIP	OTHER INTERVENTIONS ON THE SKIN AND SUBCUTANEOUS TISSUE
749	CLEFT PALATE AND CLEFT LIP	OTHER INTERVENTIONS ON THE LARYNX
749	CLEFT PALATE AND CLEFT LIP	OTHER INTERVENTIONS ON THE TRACHEA
749	CLEFT PALATE AND CLEFT LIP	OTHER INTERVENTIONS ON BONES AND FACIAL JOINTS
749	CLEFT PALATE AND CLEFT LIP	OTHER SKIN GRAFTING ON THE LIP AND MOUTH
749	CLEFT PALATE AND CLEFT LIP	ALVEOLOPLASTY
749	CLEFT PALATE AND CLEFT LIP	REMOVAL OF BRANCHIAL CYSTS OR VESTIGES
749	CLEFT PALATE AND CLEFT LIP	FISTULA CLOSURE OF THE MOUTH
749	CLEFT PALATE AND CLEFT LIP	CLEFT PALATE CORRECTION
749	CLEFT PALATE AND CLEFT LIP	GINGIVOPLASTY
749	CLEFT PALATE AND CLEFT LIP	PEDUNCULATED OR FLAP GRAFT IMPLANTATION ON THE LIP AND MOUTH
749	CLEFT PALATE AND CLEFT LIP	INCISION OF THE PALATE
749	CLEFT PALATE AND CLEFT LIP	INSERTION OF PALATAL IMPLANT
749	CLEFT PALATE AND CLEFT LIP	DERMAL APPENDIX LIGATION
750	CLEFT PALATE AND CLEFT LIP	MYRINGOTOMY WITH TUBE INSERTION
750	CLEFT PALATE AND CLEFT LIP	SEGMENTAL OSTEOPLASTY (OSTEOTOMY) OF THE JAW
750	CLEFT PALATE AND CLEFT LIP	TOTAL OSTEOTOMY OF OTHER FACIAL BONES WITH SIMULTANEOUS RECONSTRUCTION
750	CLEFT PALATE AND CLEFT LIP	CLEFT PALATE CORRECTION REVISION
750	CLEFT PALATE AND CLEFT LIP	REMOVAL OF INTERNAL FIXATION MEANS FROM FACIAL BONES
750	CLEFT PALATE AND CLEFT LIP	ENLARGEMENT RHINOPLASTY
750	CLEFT PALATE AND CLEFT LIP	PARTIAL RHINOPLASTY
750	CLEFT PALATE AND CLEFT LIP	REPAIR OF THE UVULA
750	CLEFT PALATE AND CLEFT LIP	REPAIR OF CLEFT LIP
750	CLEFT PALATE AND CLEFT LIP	NOSE TEAR SUTURE
750	CLEFT PALATE AND CLEFT LIP	LACERATION SUTURE OF THE PALATE
750	CLEFT PALATE AND CLEFT LIP	TRANSFER OF FLAP PEDUNCULATED GRAFT TO OTHER LOCATIONS
750	OTHER CONGENITAL ABNORMALITIES OF THE UPPER ALIMENTARY TRACT	OTHER INTRATHORACIC ESOPHAGEAL ANASTOMOSIS
750	OTHER CONGENITAL ABNORMALITIES OF THE UPPER ALIMENTARY TRACT	OTHER LOCAL REMOVAL OR DEMOLITION OF LESION OR TISSUE OF THE BRONCHI
750	OTHER CONGENITAL ABNORMALITIES OF THE UPPER ALIMENTARY TRACT	OTHER DEMOLITION OF LESION OR TISSUE OF THE ESOPHAGUS
750	OTHER CONGENITAL ABNORMALITIES OF THE UPPER ALIMENTARY TRACT	OTHER TOTAL GASTRECTOMY
750	OTHER CONGENITAL ABNORMALITIES OF THE UPPER ALIMENTARY TRACT	OTHER GASTROSTOMY
750	OTHER CONGENITAL ABNORMALITIES OF THE UPPER ALIMENTARY TRACT	OTHER INCISION OF THE PLEURA
750	OTHER CONGENITAL ABNORMALITIES OF THE UPPER ALIMENTARY TRACT	OTHER PYLOROPLASTY
750	OTHER CONGENITAL ABNORMALITIES OF THE UPPER ALIMENTARY TRACT	OTHER RESECTION OF THE RECTUM
750	OTHER CONGENITAL ABNORMALITIES OF THE UPPER ALIMENTARY TRACT	OTHER PLASTIC REPAIR OF THE MOUTH
750	OTHER CONGENITAL ABNORMALITIES OF THE UPPER ALIMENTARY TRACT	OTHER PERMANENT TRACHEOSTOMY
750	OTHER CONGENITAL ABNORMALITIES OF THE UPPER ALIMENTARY TRACT	OTHER REPAIRS AND PLASTIC WORK ON THE TRACHEA
750	OTHER CONGENITAL ABNORMALITIES OF THE UPPER ALIMENTARY TRACT	OTHER INTERVENTIONS FOR THE CREATION OF ESOPHAGOGASTRIC SPHINCTER
750	OTHER CONGENITAL ABNORMALITIES OF THE UPPER ALIMENTARY TRACT	OTHER INTERVENTIONS ON ORAL CAVITY
750	OTHER CONGENITAL ABNORMALITIES OF THE UPPER ALIMENTARY TRACT	OTHER TONGUE SURGERY
750	OTHER CONGENITAL ABNORMALITIES OF THE UPPER ALIMENTARY TRACT	OTHER INTERVENTIONS ON THE TRACHEA
750	OTHER CONGENITAL ABNORMALITIES OF THE UPPER ALIMENTARY TRACT	OTHER INTERVENTIONS ON THE ESOPHAGUS
750	OTHER CONGENITAL ABNORMALITIES OF THE UPPER ALIMENTARY TRACT	INTRATHORACIC ESOPHAGEAL ANASTOMOSIS WITH INTERPOSITION OF SMALL INTESTINE
750	OTHER CONGENITAL ABNORMALITIES OF THE UPPER ALIMENTARY TRACT	LOCAL REMOVAL OF OTHER LESION OR TISSUE OF THE ESOPHAGUS
750	OTHER CONGENITAL ABNORMALITIES OF THE UPPER ALIMENTARY TRACT	LOCAL REMOVAL OF ESOPHAGEAL DIVERTICULUM
750	OTHER CONGENITAL ABNORMALITIES OF THE UPPER ALIMENTARY TRACT	REMOVAL OR DEMOLITION OF LESION OR TISSUE OF THE TONGUE
750	OTHER CONGENITAL ABNORMALITIES OF THE UPPER ALIMENTARY TRACT	CLOSURE OF ANOTHER FISTULA OF THE TRACHEA
750	OTHER CONGENITAL ABNORMALITIES OF THE UPPER ALIMENTARY TRACT	Closure of skin and subcutaneous tissue of other locations
750	OTHER CONGENITAL ABNORMALITIES OF THE UPPER ALIMENTARY TRACT	CLOSURE OF BRONCHIAL FISTULA
750	OTHER CONGENITAL ABNORMALITIES OF THE UPPER ALIMENTARY TRACT	CLOSURE OF EXTERNAL FISTULA OF THE TRACHEA
750	OTHER CONGENITAL ABNORMALITIES OF THE UPPER ALIMENTARY TRACT	CLOSURE OF GASTROSTOMY
750	OTHER CONGENITAL ABNORMALITIES OF THE UPPER ALIMENTARY TRACT	CLEFT PALATE CORRECTION
750	OTHER CONGENITAL ABNORMALITIES OF THE UPPER ALIMENTARY TRACT	DILATION OF THE ESOPHAGUS
750	OTHER CONGENITAL ABNORMALITIES OF THE UPPER ALIMENTARY TRACT	DILATION BY INCISION OF THE PYLORUS
750	OTHER CONGENITAL ABNORMALITIES OF THE UPPER ALIMENTARY TRACT	PARTIAL ESOPHAGECTOMY
750	OTHER CONGENITAL ABNORMALITIES OF THE UPPER ALIMENTARY TRACT	INTRATHORACIC ESOPHAGOUS ESOPHAGOTOMY
750	OTHER CONGENITAL ABNORMALITIES OF THE UPPER ALIMENTARY TRACT	INTRATHORACIC ESOPHAGUS-GASTROSTOMY
750	OTHER CONGENITAL ABNORMALITIES OF THE UPPER ALIMENTARY TRACT	CERVICAL ESOPHAGOTOMY
750	OTHER CONGENITAL ABNORMALITIES OF THE UPPER ALIMENTARY TRACT	EXTERIORIZATION OF ESOPHAGEAL POCKET
750	OTHER CONGENITAL ABNORMALITIES OF THE UPPER ALIMENTARY TRACT	GASTROPEXYIS
750	OTHER CONGENITAL ABNORMALITIES OF THE UPPER ALIMENTARY TRACT	CHEST WALL INCISION
750	OTHER CONGENITAL ABNORMALITIES OF THE UPPER ALIMENTARY TRACT	INSERTION OF INTERCOSTAL DRAINAGE
750	OTHER CONGENITAL ABNORMALITIES OF THE UPPER ALIMENTARY TRACT	SUBCUTANEOUS INSERTION OF ELECTRIC STIMULATOR
750	OTHER CONGENITAL ABNORMALITIES OF THE UPPER ALIMENTARY TRACT	PLASTIC INTERVENTION ON THE PHARYNX
750	OTHER CONGENITAL ABNORMALITIES OF THE UPPER ALIMENTARY TRACT	LAPAROSCOPIC PROCEDURES FOR CREATING THE ESOPHAGOGASTRIC SPHINCTER
750	OTHER CONGENITAL ABNORMALITIES OF THE UPPER ALIMENTARY TRACT	PRODUCTION OF SUBCUTANEOUS TUNNEL WITHOUT ESOPHAGEAL ANASTOMOSIS
750	OTHER CONGENITAL ABNORMALITIES OF THE UPPER ALIMENTARY TRACT	PUNCTURE OF THE LUNG
751	OTHER CONGENITAL ABNORMALITIES OF THE DIGESTIVE SYSTEM	REPAIR OF ESOPHAGEAL FISTULA, NOT ELSEWHERE CLASSIFIED
751	OTHER CONGENITAL ABNORMALITIES OF THE DIGESTIVE SYSTEM	REPAIR OF GASTROSCHISIS
751	OTHER CONGENITAL ABNORMALITIES OF THE DIGESTIVE SYSTEM	REPAIR OF CLEFT LIP
751	OTHER CONGENITAL ABNORMALITIES OF THE DIGESTIVE SYSTEM	REPAIR OF ESOPHAGEAL STENOSIS
751	OTHER CONGENITAL ABNORMALITIES OF THE DIGESTIVE SYSTEM	UNILATERAL REPAIR OF INDIRECT INGUINAL HERNIA
751	OTHER CONGENITAL ABNORMALITIES OF THE DIGESTIVE SYSTEM	LACERATION SUTURE OF THE ESOPHAGUS

751	OTHER CONGENITAL ABNORMALITIES OF THE DIGESTIVE SYSTEM	THORACENTESIS
751	OTHER CONGENITAL ABNORMALITIES OF THE DIGESTIVE SYSTEM	EXPLORATORY THORACOTOMY
751	OTHER CONGENITAL ABNORMALITIES OF THE DIGESTIVE SYSTEM	TEMPORARY TRACHEOSTOMY
751	OTHER CONGENITAL ABNORMALITIES OF THE DIGESTIVE SYSTEM	TRANSFER OF FLAP PEDUNCULATED GRAFT TO OTHER LOCATIONS
751	OTHER CONGENITAL ABNORMALITIES OF THE DIGESTIVE SYSTEM	GASTROTOMY
751	OTHER CONGENITAL ABNORMALITIES OF THE DIGESTIVE SYSTEM	PYLOROMIOTOMY
751	OTHER CONGENITAL ABNORMALITIES OF THE DIGESTIVE SYSTEM	OTHER ANASTOMOSIS OF THE BILE DUCT
751	OTHER CONGENITAL ABNORMALITIES OF THE DIGESTIVE SYSTEM	OTHER ANASTOMOSIS OF THE GALLBLADDER
751	OTHER CONGENITAL ABNORMALITIES OF THE DIGESTIVE SYSTEM	OTHER TENUOUS-LARGE INTESTINAL ANASTOMOSIS
751	OTHER CONGENITAL ABNORMALITIES OF THE DIGESTIVE SYSTEM	OTHER REMOVAL OF THE COMMON BILE DUCT COLEDOCHECTOMY
751	OTHER CONGENITAL ABNORMALITIES OF THE DIGESTIVE SYSTEM	OTHER REMOVAL OF DUODENUM LESION
751	OTHER CONGENITAL ABNORMALITIES OF THE DIGESTIVE SYSTEM	OTHER REMOVAL OF LESION OF THE LARGE INTESTINE
751	OTHER CONGENITAL ABNORMALITIES OF THE DIGESTIVE SYSTEM	OTHER PARTIAL REMOVAL OF THE LARGE INTESTINE
751	OTHER CONGENITAL ABNORMALITIES OF THE DIGESTIVE SYSTEM	OTHER DEMOLITION OF LESION OF THE SMALL INTESTINE EXCEPT THE DUODENUM
751	OTHER CONGENITAL ABNORMALITIES OF THE DIGESTIVE SYSTEM	OTHER ENTEROSTOMY
751	OTHER CONGENITAL ABNORMALITIES OF THE DIGESTIVE SYSTEM	OTHER EXCISION OR DEMOLITION OF INJURY OR TISSUE OF THE PANCREAS OR PANCREATIC DUCT
751	OTHER CONGENITAL ABNORMALITIES OF THE DIGESTIVE SYSTEM	OTHER FIXATION OF THE LARGE INTESTINE
751	OTHER CONGENITAL ABNORMALITIES OF THE DIGESTIVE SYSTEM	OTHER PARTIAL GASTRECTOMY
751	OTHER CONGENITAL ABNORMALITIES OF THE DIGESTIVE SYSTEM	OTHER TOTAL GASTRECTOMY
751	OTHER CONGENITAL ABNORMALITIES OF THE DIGESTIVE SYSTEM	OTHER GASTROENTEROSTOMY WITHOUT GASTRECTOMY
751	OTHER CONGENITAL ABNORMALITIES OF THE DIGESTIVE SYSTEM	OTHER GASTROSTOMY
751	OTHER CONGENITAL ABNORMALITIES OF THE DIGESTIVE SYSTEM	OTHER INCISION OF THE SMALL INTESTINE
751	OTHER CONGENITAL ABNORMALITIES OF THE DIGESTIVE SYSTEM	OTHER INCISION OF PERIANAL TISSUES
751	OTHER CONGENITAL ABNORMALITIES OF THE DIGESTIVE SYSTEM	OTHER SURGICAL OCCLUSION OF OTHER THORACIC VESSELS
751	OTHER CONGENITAL ABNORMALITIES OF THE DIGESTIVE SYSTEM	OTHER DIAGNOSTIC PROCEDURE ON THE STOMACH
751	OTHER CONGENITAL ABNORMALITIES OF THE DIGESTIVE SYSTEM	OTHER ANTERIOR RESECTION OF THE RECTUM
751	OTHER CONGENITAL ABNORMALITIES OF THE DIGESTIVE SYSTEM	OTHER RESECTION OF THE RECTUM
751	OTHER CONGENITAL ABNORMALITIES OF THE DIGESTIVE SYSTEM	OTHER RECTAL RESECTION WITH PULL-THROUGH
751	OTHER CONGENITAL ABNORMALITIES OF THE DIGESTIVE SYSTEM	OTHER PARTIAL RESECTION OF THE SMALL INTESTINE
751	OTHER CONGENITAL ABNORMALITIES OF THE DIGESTIVE SYSTEM	OTHER REVISION OF ARTIFICIAL ORIFICE OF THE LARGE INTESTINE
751	OTHER CONGENITAL ABNORMALITIES OF THE DIGESTIVE SYSTEM	OTHER DIAPHRAGM REPAIR
751	OTHER CONGENITAL ABNORMALITIES OF THE DIGESTIVE SYSTEM	OTHER RECTAL REPAIR
751	OTHER CONGENITAL ABNORMALITIES OF THE DIGESTIVE SYSTEM	OTHER ABDOMINAL WALL REPAIR
751	OTHER CONGENITAL ABNORMALITIES OF THE DIGESTIVE SYSTEM	OTHER REPAIR OF THE SPHINCTER
751	OTHER CONGENITAL ABNORMALITIES OF THE DIGESTIVE SYSTEM	OTHER SUTURE OF THE ABDOMINAL WALL
751	OTHER CONGENITAL ABNORMALITIES OF THE DIGESTIVE SYSTEM	OTHER PERMANENT TRACHEOSTOMY
751	OTHER CONGENITAL ABNORMALITIES OF THE DIGESTIVE SYSTEM	OTHER LYSIS OF PERITONEAL ADHESIONS
751	OTHER CONGENITAL ABNORMALITIES OF THE DIGESTIVE SYSTEM	OTHER INTERVENTIONS ON THE RECTUM AND PERIRECTAL TISSUES
751	OTHER CONGENITAL ABNORMALITIES OF THE DIGESTIVE SYSTEM	OTHER INTERVENTIONS ON THE ANUS
751	OTHER CONGENITAL ABNORMALITIES OF THE DIGESTIVE SYSTEM	OTHER INTERVENTIONS ON THE INTESTINE
751	OTHER CONGENITAL ABNORMALITIES OF THE DIGESTIVE SYSTEM	OTHER LIVER TRANSPLANT
751	OTHER CONGENITAL ABNORMALITIES OF THE DIGESTIVE SYSTEM	AMPUTATION, NOS
751	OTHER CONGENITAL ABNORMALITIES OF THE DIGESTIVE SYSTEM	ANASTOMOSIS AT THE ANUS
751	OTHER CONGENITAL ABNORMALITIES OF THE DIGESTIVE SYSTEM	ANASTOMOSIS OF THE SMALL INTESTINE TO THE RECTAL STUMP
751	OTHER CONGENITAL ABNORMALITIES OF THE DIGESTIVE SYSTEM	INTRATHORACIC ESOPHAGEAL ANASTOMOSIS WITH INTERPOSITION OF SMALL INTESTINE
751	OTHER CONGENITAL ABNORMALITIES OF THE DIGESTIVE SYSTEM	ANASTOMOSIS BETWEEN GALLBLADDER AND INTESTINE
751	OTHER CONGENITAL ABNORMALITIES OF THE DIGESTIVE SYSTEM	ANASTOMOSIS BETWEEN HEPATIC DUCT AND INTESTINE
751	OTHER CONGENITAL ABNORMALITIES OF THE DIGESTIVE SYSTEM	CRASSO-CRASSUS INTESTINAL ANASTOMOSIS
751	OTHER CONGENITAL ABNORMALITIES OF THE DIGESTIVE SYSTEM	TENUOUS INTESTINAL ANASTOMOSIS
751	OTHER CONGENITAL ABNORMALITIES OF THE DIGESTIVE SYSTEM	INTESTINAL ANASTOMOSIS, NOS
751	OTHER CONGENITAL ABNORMALITIES OF THE DIGESTIVE SYSTEM	LAPAROSCOPIC APPENDECTOMY
751	OTHER CONGENITAL ABNORMALITIES OF THE DIGESTIVE SYSTEM	REMOVAL OF THE RESIDUAL CYSTIC DUCT
751	OTHER CONGENITAL ABNORMALITIES OF THE DIGESTIVE SYSTEM	REMOVAL OF OTHER BILE DUCT
751	OTHER CONGENITAL ABNORMALITIES OF THE DIGESTIVE SYSTEM	REMOVAL OF LESION OR TISSUE OF THE DIAPHRAGM
751	OTHER CONGENITAL ABNORMALITIES OF THE DIGESTIVE SYSTEM	LOCAL REMOVAL OF DUODENUM LESION
751	OTHER CONGENITAL ABNORMALITIES OF THE DIGESTIVE SYSTEM	LOCAL REMOVAL OF LESION OR TISSUE OF THE RECTUM
751	OTHER CONGENITAL ABNORMALITIES OF THE DIGESTIVE SYSTEM	LOCAL REMOVAL OF LESION OR TISSUE OF THE LARGE INTESTINE
751	OTHER CONGENITAL ABNORMALITIES OF THE DIGESTIVE SYSTEM	LOCAL REMOVAL OF LESION OR TISSUE OF THE SMALL INTESTINE EXCEPT THE DUODENUM
751	OTHER CONGENITAL ABNORMALITIES OF THE DIGESTIVE SYSTEM	ANAL CIRCLE
751	OTHER CONGENITAL ABNORMALITIES OF THE DIGESTIVE SYSTEM	CLOSURE OF ANAL FISTULA
751	OTHER CONGENITAL ABNORMALITIES OF THE DIGESTIVE SYSTEM	CLOSURE OF VESICO-INTESTINAL FISTULA
751	OTHER CONGENITAL ABNORMALITIES OF THE DIGESTIVE SYSTEM	CLOSURE OF ARTIFICIAL ORIFICE OF THE LARGE INTESTINE
751	OTHER CONGENITAL ABNORMALITIES OF THE DIGESTIVE SYSTEM	CLOSURE OF ARTIFICIAL ORIFICE OF THE SMALL INTESTINE
751	OTHER CONGENITAL ABNORMALITIES OF THE DIGESTIVE SYSTEM	CHOLECYSTECTOMY
751	OTHER CONGENITAL ABNORMALITIES OF THE DIGESTIVE SYSTEM	LAPAROSCOPIC CHOLECYSTECTOMY
751	OTHER CONGENITAL ABNORMALITIES OF THE DIGESTIVE SYSTEM	INTRAABDOMINAL TOTAL COLECTOMY
751	OTHER CONGENITAL ABNORMALITIES OF THE DIGESTIVE SYSTEM	COLEDOCOENTEROSTOMY
751	OTHER CONGENITAL ABNORMALITIES OF THE DIGESTIVE SYSTEM	PERMANENT COLOSTOMY
751	OTHER CONGENITAL ABNORMALITIES OF THE DIGESTIVE SYSTEM	TEMPORARY COLOSTOMY
751	OTHER CONGENITAL ABNORMALITIES OF THE DIGESTIVE SYSTEM	COLOSTOMY
751	OTHER CONGENITAL ABNORMALITIES OF THE DIGESTIVE SYSTEM	DILATION OF THE INTESTINE
751	OTHER CONGENITAL ABNORMALITIES OF THE DIGESTIVE SYSTEM	LEFT HEMICOLECTOMY
751	OTHER CONGENITAL ABNORMALITIES OF THE DIGESTIVE SYSTEM	PARTIAL HEPATECTOMY
751	OTHER CONGENITAL ABNORMALITIES OF THE DIGESTIVE SYSTEM	TOTAL HEPATECTOMY
751	OTHER CONGENITAL ABNORMALITIES OF THE DIGESTIVE SYSTEM	INTRATHORACIC ESOPHAGOUS ESOPHAGOTOMY
751	OTHER CONGENITAL ABNORMALITIES OF THE DIGESTIVE SYSTEM	EXTERNALIZATION OF THE LARGE INTESTINE
751	OTHER CONGENITAL ABNORMALITIES OF THE DIGESTIVE SYSTEM	EXTERNALIZATION OF THE SMALL INTESTINE

751	OTHER CONGENITAL ABNORMALITIES OF THE DIGESTIVE SYSTEM	FIXATION OF INTESTINES, NOS
751	OTHER CONGENITAL ABNORMALITIES OF THE DIGESTIVE SYSTEM	TOTAL GASTRECTOMY WITH INTESTINAL INTERPOSITION
751	OTHER CONGENITAL ABNORMALITIES OF THE DIGESTIVE SYSTEM	TEMPORARY ILEOSTOMY
751	OTHER CONGENITAL ABNORMALITIES OF THE DIGESTIVE SYSTEM	INCISION OF THE DUODENUM
751	OTHER CONGENITAL ABNORMALITIES OF THE DIGESTIVE SYSTEM	INCISION OF THE PERITONEUM
751	OTHER CONGENITAL ABNORMALITIES OF THE DIGESTIVE SYSTEM	ANAL SEPTAL INCISION
751	OTHER CONGENITAL ABNORMALITIES OF THE DIGESTIVE SYSTEM	ISOLATION OF SEGMENT OF SMALL INTESTINE
751	OTHER CONGENITAL ABNORMALITIES OF THE DIGESTIVE SYSTEM	INTRAABDOMINAL MANIPULATION OF THE LARGE INTESTINE
751	OTHER CONGENITAL ABNORMALITIES OF THE DIGESTIVE SYSTEM	INTRAABDOMINAL MANIPULATION OF THE SMALL INTESTINE
751	OTHER CONGENITAL ABNORMALITIES OF THE DIGESTIVE SYSTEM	INTRAABDOMINAL MANIPULATION OF THE INTESTINE, NOT OTHERWISE SPECIFIED
751	OTHER CONGENITAL ABNORMALITIES OF THE DIGESTIVE SYSTEM	ANORECTAL MYOMECTOMY
751	OTHER CONGENITAL ABNORMALITIES OF THE DIGESTIVE SYSTEM	PILOROTOMY
751	OTHER CONGENITAL ABNORMALITIES OF THE DIGESTIVE SYSTEM	RESECTION OF THE CAECUM
751	OTHER CONGENITAL ABNORMALITIES OF THE DIGESTIVE SYSTEM	RESECTION OF THE TRANSVERSE COLON
751	OTHER CONGENITAL ABNORMALITIES OF THE DIGESTIVE SYSTEM	RECTAL RESECTION BY ABDOMINOPERINEAL ROUTE
751	OTHER CONGENITAL ABNORMALITIES OF THE DIGESTIVE SYSTEM	RESECTION OF THE RECTUM ACCORDING TO DUHAMEL
751	OTHER CONGENITAL ABNORMALITIES OF THE DIGESTIVE SYSTEM	RESECTION OF THE SUBMUCOSA OF THE RECTUM (ACCORDING TO SOAVE)
751	OTHER CONGENITAL ABNORMALITIES OF THE DIGESTIVE SYSTEM	EXTERNALIZED SEGMENT RESECTION OF THE SMALL INTESTINE
751	OTHER CONGENITAL ABNORMALITIES OF THE DIGESTIVE SYSTEM	POSTERIOR RESECTION OF THE RECTUM
751	OTHER CONGENITAL ABNORMALITIES OF THE DIGESTIVE SYSTEM	MULTIPLE SEGMENTAL RESECTION OF THE LARGE INTESTINE
751	OTHER CONGENITAL ABNORMALITIES OF THE DIGESTIVE SYSTEM	MULTIPLE SEGMENTAL RESECTION OF THE SMALL INTESTINE
751	OTHER CONGENITAL ABNORMALITIES OF THE DIGESTIVE SYSTEM	RECTO-RECTOSTOMY
751	OTHER CONGENITAL ABNORMALITIES OF THE DIGESTIVE SYSTEM	CYSTOSTOMY REVISION
751	OTHER CONGENITAL ABNORMALITIES OF THE DIGESTIVE SYSTEM	REVISION OF ARTIFICIAL ORIFICE OF THE SMALL INTESTINE
751	OTHER CONGENITAL ABNORMALITIES OF THE DIGESTIVE SYSTEM	REVIEW OF ARTIFICIAL INTESTINAL ORIFICE, NOS
751	OTHER CONGENITAL ABNORMALITIES OF THE DIGESTIVE SYSTEM	REDUCTION OF PROLAPSE
751	OTHER CONGENITAL ABNORMALITIES OF THE DIGESTIVE SYSTEM	TOTAL REMOVAL OF THE SMALL INTESTINE
751	OTHER CONGENITAL ABNORMALITIES OF THE DIGESTIVE SYSTEM	BILATERAL REPAIR OF INDIRECT INGUINAL HERNIA
751	OTHER CONGENITAL ABNORMALITIES OF THE DIGESTIVE SYSTEM	BILATERAL REPAIR OF INGUINAL HERNIA, NOS
751	OTHER CONGENITAL ABNORMALITIES OF THE DIGESTIVE SYSTEM	REPAIR OF CHEST DIAPHRAGMATIC HERNIA, TORACHIC ACCESS
751	OTHER CONGENITAL ABNORMALITIES OF THE DIGESTIVE SYSTEM	REPAIR OF DIAPHRAGMATIC HERNIA, ABDOMINAL ACCESS
751	OTHER CONGENITAL ABNORMALITIES OF THE DIGESTIVE SYSTEM	HERNIA REPAIR ON INCISION WITH PROSTHESIS
751	OTHER CONGENITAL ABNORMALITIES OF THE DIGESTIVE SYSTEM	REPAIR OF GASTROSCHISIS
751	OTHER CONGENITAL ABNORMALITIES OF THE DIGESTIVE SYSTEM	UNILATERAL REPAIR OF INDIRECT INGUINAL HERNIA
751	OTHER CONGENITAL ABNORMALITIES OF THE DIGESTIVE SYSTEM	UNILATERAL REPAIR OF INGUINAL HERNIA, NOI
751	OTHER CONGENITAL ABNORMALITIES OF THE DIGESTIVE SYSTEM	POSTERIOR ANAL SPHINCTEROTOMY
751	OTHER CONGENITAL ABNORMALITIES OF THE DIGESTIVE SYSTEM	SUTURE OF LACERATION THE LARGE INTESTINE
752	CONGENITAL ANOMALIES OF THE GENITAL ORGANS	OTHER LOCAL REMOVAL OR DESTRUCTION OF THE OVARY
752	CONGENITAL ANOMALIES OF THE GENITAL ORGANS	OTHER REMOVAL OR DEMOLITION OF THE UTERUS AND SUPPORTING STRUCTURES
752	CONGENITAL ANOMALIES OF THE GENITAL ORGANS	OTHER LOCAL REMOVAL OR DEMOLITION OF THE VULVA AND PERINEUM
752	CONGENITAL ANOMALIES OF THE GENITAL ORGANS	OTHER LOCAL REMOVAL OR DEMOLITION OF THE OVARY
752	CONGENITAL ANOMALIES OF THE GENITAL ORGANS	OTHER UNILATERAL LAPAROSCOPIC OVARIOTOMY
752	CONGENITAL ANOMALIES OF THE GENITAL ORGANS	OTHER REMOVAL OF BOTH OVARIES AND TUBES IN THE SAME OPERATION
752	CONGENITAL ANOMALIES OF THE GENITAL ORGANS	OTHER PENIS REPAIR
752	CONGENITAL ANOMALIES OF THE GENITAL ORGANS	OTHER REPAIR OF THE VULVA AND PERINEUM
752	CONGENITAL ANOMALIES OF THE GENITAL ORGANS	OTHER OVARIAN REPAIR
752	CONGENITAL ANOMALIES OF THE GENITAL ORGANS	OTHER URETHRAL REPAIR
752	CONGENITAL ANOMALIES OF THE GENITAL ORGANS	OTHER URETHRAL RECONSTRUCTIONS
752	CONGENITAL ANOMALIES OF THE GENITAL ORGANS	OTHER REPAIRS OF THE SCROTUM AND VAGINAL TUNIC
752	CONGENITAL ANOMALIES OF THE GENITAL ORGANS	OTHER INTERVENTIONS ON THE PENIS
752	CONGENITAL ANOMALIES OF THE GENITAL ORGANS	OTHER INTERVENTIONS ON THE VULVA
752	CONGENITAL ANOMALIES OF THE GENITAL ORGANS	OTHER INTERVENTIONS ON THE FEMALE GENITAL APPARATUS
752	CONGENITAL ANOMALIES OF THE GENITAL ORGANS	OTHER INTERVENTIONS ON THE MALE GENITAL APPARATUS
752	CONGENITAL ANOMALIES OF THE GENITAL ORGANS	OTHER INTERVENTIONS ON THE SCROTUM AND VAGINAL TUNIC
752	CONGENITAL ANOMALIES OF THE GENITAL ORGANS	OTHER INTERVENTIONS ON THE OVARY
752	CONGENITAL ANOMALIES OF THE GENITAL ORGANS	REMOVAL OF HYDROCELE (OF THE VAGINAL TUNIC)
752	CONGENITAL ANOMALIES OF THE GENITAL ORGANS	REMOVAL OR DEMOLITION OF VAGINAL INJURY
752	CONGENITAL ANOMALIES OF THE GENITAL ORGANS	REMOVAL OR DEMOLITION OF TUBAL INJURY
752	CONGENITAL ANOMALIES OF THE GENITAL ORGANS	REMOVAL OR DEMOLITION OF TESTICULAR INJURY
752	CONGENITAL ANOMALIES OF THE GENITAL ORGANS	CIRCUMCISION
752	CONGENITAL ANOMALIES OF THE GENITAL ORGANS	CONSTRUCTION OF THE PENIS
752	CONGENITAL ANOMALIES OF THE GENITAL ORGANS	URETHRAL DILATION
752	CONGENITAL ANOMALIES OF THE GENITAL ORGANS	INCISION AND DRAINAGE OF THE SCROTUM AND VAGINAL TUNIC
752	CONGENITAL ANOMALIES OF THE GENITAL ORGANS	CLITORAL INTERVENTIONS
752	CONGENITAL ANOMALIES OF THE GENITAL ORGANS	LIBERATION OF PENILE SYNECHIAE
752	CONGENITAL ANOMALIES OF THE GENITAL ORGANS	LYSIS OF INTRALUMINAL ADHESIONS OF THE VAGINA
752	CONGENITAL ANOMALIES OF THE GENITAL ORGANS	LYSIS OF VULVAR ADHESIONS
752	CONGENITAL ANOMALIES OF THE GENITAL ORGANS	URETHRAL MEATOPLASTY
752	CONGENITAL ANOMALIES OF THE GENITAL ORGANS	UNILATERAL ORCHIECTOMY
752	CONGENITAL ANOMALIES OF THE GENITAL ORGANS	ORCHIOPESSI
752	CONGENITAL ANOMALIES OF THE GENITAL ORGANS	LAPAROSCOPIC OVARIOTOMY
752	CONGENITAL ANOMALIES OF THE GENITAL ORGANS	UNILATERAL LAPAROSCOPIC OVARIOTOMY
752	CONGENITAL ANOMALIES OF THE GENITAL ORGANS	FORESKIN SLIP PLASTICS
752	CONGENITAL ANOMALIES OF THE GENITAL ORGANS	CUNEIFORM RESECTION OF THE OVARY
752	CONGENITAL ANOMALIES OF THE GENITAL ORGANS	PENIS RECONSTRUCTION
752	CONGENITAL ANOMALIES OF THE GENITAL ORGANS	RECONSTRUCTION OF THE VAGINA
752	CONGENITAL ANOMALIES OF THE GENITAL ORGANS	RECONSTRUCTION OF EXTROPHIC BLADDER

752	CONGENITAL ANOMALIES OF THE GENITAL ORGANS	RELEASE OF THE PENIS ROPE
752	CONGENITAL ANOMALIES OF THE GENITAL ORGANS	REMOVAL OF BOTH OVARIES IN THE SAME OPERATION
752	CONGENITAL ANOMALIES OF THE GENITAL ORGANS	REPAIR OF OTHER FISTULA OF THE VAGINA
752	CONGENITAL ANOMALIES OF THE GENITAL ORGANS	REPAIR OF COLON-VULAR FISTULA
752	CONGENITAL ANOMALIES OF THE GENITAL ORGANS	REPAIR OF RECTOVAGINAL FISTULA
752	CONGENITAL ANOMALIES OF THE GENITAL ORGANS	REPAIR OF HYPOSPADIAS OR EPISPADIAS
753	CONGENITAL ABNORMALITIES OF THE URINARY SYSTEM	OTHER ANASTOMOSIS OR BYPASS OF THE URETER
753	CONGENITAL ABNORMALITIES OF THE URINARY SYSTEM	OTHER LOCAL REMOVAL OR DEMOLITION OF LESION OR TISSUE OF THE URETHRA
753	CONGENITAL ABNORMALITIES OF THE URINARY SYSTEM	OTHER BLADDER PLASTIC SURGERY BLADDER SUSPENSION NOT CLASSIFIED ELSEWHERE
753	CONGENITAL ABNORMALITIES OF THE URINARY SYSTEM	OTHER OPEN BLADDER SURGERY
753	CONGENITAL ABNORMALITIES OF THE URINARY SYSTEM	OTHER CYSTOTOMY
753	CONGENITAL ABNORMALITIES OF THE URINARY SYSTEM	OTHER UMBILICAL HERNIORRAPHY
753	CONGENITAL ABNORMALITIES OF THE URINARY SYSTEM	OTHER LYSIS OF PERIRENAL OR PERIURETHRAL ADHESIONS
753	CONGENITAL ABNORMALITIES OF THE URINARY SYSTEM	OTHER RESECTION OF THE RECTUM
753	CONGENITAL ABNORMALITIES OF THE URINARY SYSTEM	OTHER TRANSURETHRAL RESECTION OF BLADDER LESION OR NEOPLASM
753	CONGENITAL ABNORMALITIES OF THE URINARY SYSTEM	OTHER REPAIR OF THE URETER
753	CONGENITAL ABNORMALITIES OF THE URINARY SYSTEM	OTHER URETHRAL REPAIR
753	CONGENITAL ABNORMALITIES OF THE URINARY SYSTEM	OTHER URETHRAL RECONSTRUCTIONS
753	CONGENITAL ABNORMALITIES OF THE URINARY SYSTEM	OTHER BLADDER RECONSTRUCTIONS
753	CONGENITAL ABNORMALITIES OF THE URINARY SYSTEM	OTHER INTERVENTIONS ON THE KIDNEY
753	CONGENITAL ABNORMALITIES OF THE URINARY SYSTEM	OTHER INTERVENTIONS ON PERIRENAL OR PERIVESCIAL TISSUE
753	CONGENITAL ABNORMALITIES OF THE URINARY SYSTEM	OTHER BLADDER SURGERIES
753	CONGENITAL ABNORMALITIES OF THE URINARY SYSTEM	OTHER INTERVENTIONS ON THE URINARY TRACT
753	CONGENITAL ABNORMALITIES OF THE URINARY SYSTEM	OTHER INTERVENTIONS ON THE URETER
753	CONGENITAL ABNORMALITIES OF THE URINARY SYSTEM	OTHER INTERVENTIONS ON THE URETHRA AND PERIURETHRAL TISSUE
753	CONGENITAL ABNORMALITIES OF THE URINARY SYSTEM	RENAL-PYELO-URETERAL ANASTOMOSIS
753	CONGENITAL ABNORMALITIES OF THE URINARY SYSTEM	ARTERIOVENOSTOMY FOR RENAL DIALYSIS
753	CONGENITAL ABNORMALITIES OF THE URINARY SYSTEM	RENAL PERCUTANEOUS ASPIRATION
753	CONGENITAL ABNORMALITIES OF THE URINARY SYSTEM	REMOVAL OF THE URACUS
753	CONGENITAL ABNORMALITIES OF THE URINARY SYSTEM	LOCAL REMOVAL OF LESION OR TISSUE OF THE RECTUM
753	CONGENITAL ABNORMALITIES OF THE URINARY SYSTEM	REMOVAL OR DEMOLITION OF ABDOMINAL OR HUMBILICUS WALL TISSUE OR TISSUE
753	CONGENITAL ABNORMALITIES OF THE URINARY SYSTEM	ENDOSCOPIC REMOVAL OR DEMOLITION OF LESION OR TISSUE OF THE URETHRA
753	CONGENITAL ABNORMALITIES OF THE URINARY SYSTEM	CLOSURE OF CYSTOSTOMY
753	CONGENITAL ABNORMALITIES OF THE URINARY SYSTEM	CLOSURE OF URETHRAL FISTULA
753	CONGENITAL ABNORMALITIES OF THE URINARY SYSTEM	CLOSURE OF VESICO-INTESTINAL FISTULA
753	CONGENITAL ABNORMALITIES OF THE URINARY SYSTEM	PARTIAL CYSTECTOMY
753	CONGENITAL ABNORMALITIES OF THE URINARY SYSTEM	CYSTOSTOMY AND SUPRAPUBIC CYSTOLYTOTOMY
753	CONGENITAL ABNORMALITIES OF THE URINARY SYSTEM	PERCUTANEOUS CYSTOSTOMY
753	CONGENITAL ABNORMALITIES OF THE URINARY SYSTEM	CISTOURETROPLASTY AND PLASTIC SURGERY OF THE BLADDER NECK
753	CONGENITAL ABNORMALITIES OF THE URINARY SYSTEM	PARAURETERAL SUSPENSION OF THE UTERUS
753	CONGENITAL ABNORMALITIES OF THE URINARY SYSTEM	CREATION OF PERMANENT SUPRAPUBIC CYSTOSTOMY
753	CONGENITAL ABNORMALITIES OF THE URINARY SYSTEM	DILATION OF THE URETERAL PAPILLA
753	CONGENITAL ABNORMALITIES OF THE URINARY SYSTEM	URETHRAL DILATION
753	CONGENITAL ABNORMALITIES OF THE URINARY SYSTEM	TRANSURETHRAL DRAINAGE OF THE BLADDER
753	CONGENITAL ABNORMALITIES OF THE URINARY SYSTEM	ENDOSCOPIC EXTRACTION FROM THE RENAL URETER AND PELVIS OF: BLOOD CLOT, STONE, FOREIGN BODY
753	CONGENITAL ABNORMALITIES OF THE URINARY SYSTEM	IMPLANT FOR INJECTION INTO THE URETHRA AND/OR BLADDER NECK
753	CONGENITAL ABNORMALITIES OF THE URINARY SYSTEM	INCISION OF THE ABDOMINAL WALL
753	CONGENITAL ABNORMALITIES OF THE URINARY SYSTEM	CLITORAL INTERVENTIONS
753	CONGENITAL ABNORMALITIES OF THE URINARY SYSTEM	LAPAROSCOPIC LYSIS OF ADHESIONS OF PERIRENAL OR PERIURETHRAL TISSUE
753	CONGENITAL ABNORMALITIES OF THE URINARY SYSTEM	TRANSURETHRAL LYSIS OF INTRALUMINAL ADHESIONS
753	CONGENITAL ABNORMALITIES OF THE URINARY SYSTEM	URETHRAL MEATOPLASTY
753	CONGENITAL ABNORMALITIES OF THE URINARY SYSTEM	URETHRAL MEATOTOMY
753	CONGENITAL ABNORMALITIES OF THE URINARY SYSTEM	BILATERAL NEPHRECTOMY
753	CONGENITAL ABNORMALITIES OF THE URINARY SYSTEM	PARTIAL NEPHRECTOMY (WITHOUT URETERECTOMY)
753	CONGENITAL ABNORMALITIES OF THE URINARY SYSTEM	SURGICAL NEPHROSTOMY
753	CONGENITAL ABNORMALITIES OF THE URINARY SYSTEM	PERCUTANEOUS NEPHROSTOMY WITHOUT FRAGMENTATION
753	CONGENITAL ABNORMALITIES OF THE URINARY SYSTEM	NEPHROURETERECTOMY
753	CONGENITAL ABNORMALITIES OF THE URINARY SYSTEM	NEOBLADDER CONTINENT AND BLADDER ENLARGEMENT
753	CONGENITAL ABNORMALITIES OF THE URINARY SYSTEM	PAPILLOTOMY OR URETERAL MEATOTOMY (ENDOSCOPIC OR NON-ENDOSCOPIC)
753	CONGENITAL ABNORMALITIES OF THE URINARY SYSTEM	PIELECTOMY OR PIELOTOMY
753	CONGENITAL ABNORMALITIES OF THE URINARY SYSTEM	PYELOPLASTICS
753	CONGENITAL ABNORMALITIES OF THE URINARY SYSTEM	SURGICAL PYELOSTOMY AND PERCUTANEOUS PYELOSTOMY
753	CONGENITAL ABNORMALITIES OF THE URINARY SYSTEM	PERCUTANEOUS URINE SAMPLING
753	CONGENITAL ABNORMALITIES OF THE URINARY SYSTEM	CYSTOSTOMY REVISION
753	CONGENITAL ABNORMALITIES OF THE URINARY SYSTEM	REVISION OF URETEROCUTANEOUSOSTOMY
753	CONGENITAL ABNORMALITIES OF THE URINARY SYSTEM	RECONSTRUCTION OF EXTROPHIC BLADDER
753	CONGENITAL ABNORMALITIES OF THE URINARY SYSTEM	SWAB REMOVAL AND POSTSURGICAL BLADDER HEMOSTASIS
753	CONGENITAL ABNORMALITIES OF THE URINARY SYSTEM	RENAL PEDUNCLE REPAIR
753	CONGENITAL ABNORMALITIES OF THE URINARY SYSTEM	URETEROSTOMY SUTURE
753	CONGENITAL ABNORMALITIES OF THE URINARY SYSTEM	PARTIAL OR SEGMENTAL URETERECTOMY
753	CONGENITAL ABNORMALITIES OF THE URINARY SYSTEM	TOTAL URETERECTOMY
753	CONGENITAL ABNORMALITIES OF THE URINARY SYSTEM	URETERECTOMY,SAI
753	CONGENITAL ABNORMALITIES OF THE URINARY SYSTEM	DIRECT URETERO-NEOCYSTOSTOMY, WITH ANTI-REFLUX PLASTIC OR WITH BLADDER FLAP
753	CONGENITAL ABNORMALITIES OF THE URINARY SYSTEM	ENDOSCOPIC URETHROTOMY
753	CONGENITAL ABNORMALITIES OF THE URINARY SYSTEM	URETERO-TRANS-URETEROANASTOMOSI
753	CONGENITAL ABNORMALITIES OF THE URINARY SYSTEM	URETROTOMY
753	CONGENITAL ABNORMALITIES OF THE URINARY SYSTEM	ENDOSCOPIC URETEROTOMY

754	SOME CONGENITAL MALFORMATIONS OF THE MUSCULOSKELETAL SYSTEM	OTHER ARTHROTOMY OF THE FOOT AND TOES
754	SOME CONGENITAL MALFORMATIONS OF THE MUSCULOSKELETAL SYSTEM	OTHER ANKLE ARTHROTOMY
754	SOME CONGENITAL MALFORMATIONS OF THE MUSCULOSKELETAL SYSTEM	OTHER REMOVAL OF THE JOINT OF THE FOOT AND TOES
754	SOME CONGENITAL MALFORMATIONS OF THE MUSCULOSKELETAL SYSTEM	OTHER REMOVAL OF THE ANKLE JOINT
754	SOME CONGENITAL MALFORMATIONS OF THE MUSCULOSKELETAL SYSTEM	OTHER REMOVAL OF THE JOINT AT AN UNSPECIFIED LOCATION
754	SOME CONGENITAL MALFORMATIONS OF THE MUSCULOSKELETAL SYSTEM	OTHER REMOVAL OF SOFT TISSUES
754	SOME CONGENITAL MALFORMATIONS OF THE MUSCULOSKELETAL SYSTEM	OTHER REMOVAL, MELTING OR REPAIR OF FINGERS
754	SOME CONGENITAL MALFORMATIONS OF THE MUSCULOSKELETAL SYSTEM	OTHER CRANIOTOMY
754	SOME CONGENITAL MALFORMATIONS OF THE MUSCULOSKELETAL SYSTEM	OTHER INCISION OF THE FEMUR WITHOUT SECTION
754	SOME CONGENITAL MALFORMATIONS OF THE MUSCULOSKELETAL SYSTEM	OTHER ORBITOTOMY
754	SOME CONGENITAL MALFORMATIONS OF THE MUSCULOSKELETAL SYSTEM	OTHER PARTIAL OSTEOTOMY AT UNSPECIFIED LOCATION
754	SOME CONGENITAL MALFORMATIONS OF THE MUSCULOSKELETAL SYSTEM	OTHER REPAIR OR RECONSTRUCTION OF SKIN AND SUBCUTANEOUS TISSUE
754	SOME CONGENITAL MALFORMATIONS OF THE MUSCULOSKELETAL SYSTEM	OTHER PLASTIC REPAIR OF THE MOUTH
754	SOME CONGENITAL MALFORMATIONS OF THE MUSCULOSKELETAL SYSTEM	OTHER SECTION OF THE FEMUR
754	SOME CONGENITAL MALFORMATIONS OF THE MUSCULOSKELETAL SYSTEM	OTHER SECTION OF THE TARSUS AND METATARSUS
754	SOME CONGENITAL MALFORMATIONS OF THE MUSCULOSKELETAL SYSTEM	OTHER SUTURE OF TENDONS
754	SOME CONGENITAL MALFORMATIONS OF THE MUSCULOSKELETAL SYSTEM	OTHER TENDONECTOMY
754	SOME CONGENITAL MALFORMATIONS OF THE MUSCULOSKELETAL SYSTEM	OTHER TENOTOMY
754	SOME CONGENITAL MALFORMATIONS OF THE MUSCULOSKELETAL SYSTEM	OTHER PERMANENT TRACHEOSTOMY
754	SOME CONGENITAL MALFORMATIONS OF THE MUSCULOSKELETAL SYSTEM	OTHER TURBINECTOMY
754	SOME CONGENITAL MALFORMATIONS OF THE MUSCULOSKELETAL SYSTEM	OTHER CHANGES IN THE LENGTH OF MUSCLES AND TENDONS
754	SOME CONGENITAL MALFORMATIONS OF THE MUSCULOSKELETAL SYSTEM	OTHER PLASTIC INTERVENTIONS ON TENDONS
754	SOME CONGENITAL MALFORMATIONS OF THE MUSCULOSKELETAL SYSTEM	OTHER REPAIRS OR PLASTIC ON TARSUS AND METATARSUS
754	SOME CONGENITAL MALFORMATIONS OF THE MUSCULOSKELETAL SYSTEM	OTHER INTERVENTIONS ON THE SKIN AND SUBCUTANEOUS TISSUE
754	SOME CONGENITAL MALFORMATIONS OF THE MUSCULOSKELETAL SYSTEM	OTHER INTERVENTIONS ON BONES AND FACIAL JOINTS
754	SOME CONGENITAL MALFORMATIONS OF THE MUSCULOSKELETAL SYSTEM	OTHER TYPES OF OSTEOPLASTY OF THE SKULL
754	SOME CONGENITAL MALFORMATIONS OF THE MUSCULOSKELETAL SYSTEM	AMPUTATION OF TOES
754	SOME CONGENITAL MALFORMATIONS OF THE MUSCULOSKELETAL SYSTEM	REMOVAL OR DEMOLITION OF ANOTHER OUTER EAR INJURY
754	SOME CONGENITAL MALFORMATIONS OF THE MUSCULOSKELETAL SYSTEM	LOCAL REMOVAL OR DEMOLITION OF ANOTHER NOSE INJURY
754	SOME CONGENITAL MALFORMATIONS OF THE MUSCULOSKELETAL SYSTEM	TENDON ADVANCEMENT
754	SOME CONGENITAL MALFORMATIONS OF THE MUSCULOSKELETAL SYSTEM	CLOSURE OF ANOTHER FISTULA OF THE TRACHEA
754	SOME CONGENITAL MALFORMATIONS OF THE MUSCULOSKELETAL SYSTEM	CLEFT PALATE CORRECTION
754	SOME CONGENITAL MALFORMATIONS OF THE MUSCULOSKELETAL SYSTEM	CLUBFOOT CORRECTION, NOT CLASSIFIED ELSEWHERE
754	SOME CONGENITAL MALFORMATIONS OF THE MUSCULOSKELETAL SYSTEM	FASCIOTOMY
754	SOME CONGENITAL MALFORMATIONS OF THE MUSCULOSKELETAL SYSTEM	INTERNAL FIXATION OF THE FEMUR WITHOUT REDUCTION OF FRACTURE
754	SOME CONGENITAL MALFORMATIONS OF THE MUSCULOSKELETAL SYSTEM	INTERNAL FIXATION OF TARSUS AND METATARSUS WITHOUT REDUCTION OF FRACTURE
754	SOME CONGENITAL MALFORMATIONS OF THE MUSCULOSKELETAL SYSTEM	INTERNAL FIXATION OF TIBIA AND FIBULA WITHOUT FRACTURE REDUCTION
754	SOME CONGENITAL MALFORMATIONS OF THE MUSCULOSKELETAL SYSTEM	SUB-ASTROGAL FUSION
754	SOME CONGENITAL MALFORMATIONS OF THE MUSCULOSKELETAL SYSTEM	GINGIVOPLASTY
754	SOME CONGENITAL MALFORMATIONS OF THE MUSCULOSKELETAL SYSTEM	INCISION OF THE PALATE
754	SOME CONGENITAL MALFORMATIONS OF THE MUSCULOSKELETAL SYSTEM	INCISION OF JOINT CAPSULE, LIGAMENTS OR CARTILAGE OF THE FOOT AND TOES
754	SOME CONGENITAL MALFORMATIONS OF THE MUSCULOSKELETAL SYSTEM	INCISION OF JOINT CAPSULE, LIGAMENTS OR ANKLE CARTILAGE
754	SOME CONGENITAL MALFORMATIONS OF THE MUSCULOSKELETAL SYSTEM	INCISION OF JOINT CAPSULE, LIGAMENTS OR CARTILAGE IN AN UNSPECIFIED LOCATION
754	SOME CONGENITAL MALFORMATIONS OF THE MUSCULOSKELETAL SYSTEM	INJECTION OF THERAPEUTIC SUBSTANCES INTO THE JOINT OR LIGAMENT
754	SOME CONGENITAL MALFORMATIONS OF THE MUSCULOSKELETAL SYSTEM	GRAFTING OF MUSCLES OR BANDS
754	SOME CONGENITAL MALFORMATIONS OF THE MUSCULOSKELETAL SYSTEM	LYSIS OF ADHESIONS OF MUSCLES, TENDONS, BANDS AND BAGS
754	SOME CONGENITAL MALFORMATIONS OF THE MUSCULOSKELETAL SYSTEM	DEVELOPMENT OF ORTHOTIC APPARATUS
754	SOME CONGENITAL MALFORMATIONS OF THE MUSCULOSKELETAL SYSTEM	SEGMENTAL OSTEOPLASTY (OSTEOTOMY) OF THE JAW
754	SOME CONGENITAL MALFORMATIONS OF THE MUSCULOSKELETAL SYSTEM	REINSERTION OF TENDONS
754	SOME CONGENITAL MALFORMATIONS OF THE MUSCULOSKELETAL SYSTEM	CUNEIFORM RESECTION OF THE FEMUR
754	SOME CONGENITAL MALFORMATIONS OF THE MUSCULOSKELETAL SYSTEM	RHINOPLASTY REVIEW
754	SOME CONGENITAL MALFORMATIONS OF THE MUSCULOSKELETAL SYSTEM	CRUENT REDUCTION OF KNEE DISLOCATION
754	SOME CONGENITAL MALFORMATIONS OF THE MUSCULOSKELETAL SYSTEM	CRUENT REDUCTION OF HIP DISLOCATION
754	SOME CONGENITAL MALFORMATIONS OF THE MUSCULOSKELETAL SYSTEM	NON CRUENT REDUCTION OF TARSUS AND METATARSAL FRACTURE WITHOUT INTERNAL FIXATION
754	SOME CONGENITAL MALFORMATIONS OF THE MUSCULOSKELETAL SYSTEM	NON CRUENT REDUCTION OF KNEE DISLOCATION
754	SOME CONGENITAL MALFORMATIONS OF THE MUSCULOSKELETAL SYSTEM	NON CRUENT REDUCTION OF HIP DISLOCATION
754	SOME CONGENITAL MALFORMATIONS OF THE MUSCULOSKELETAL SYSTEM	NON CRUENT REDUCTION OF DISLOCATION IN ANOTHER SPECIFIED LOCATION
754	SOME CONGENITAL MALFORMATIONS OF THE MUSCULOSKELETAL SYSTEM	LUMBAR AND LUMBOSACRAL RECASTING, WITH POSTERIOR APPROACH
754	SOME CONGENITAL MALFORMATIONS OF THE MUSCULOSKELETAL SYSTEM	REMOVAL OF IMPLANTED DEVICE FROM TARSUS AND METATARSUS
754	SOME CONGENITAL MALFORMATIONS OF THE MUSCULOSKELETAL SYSTEM	REMOVAL OF IMPLANTED DEVICE FROM THE FEMUR
754	SOME CONGENITAL MALFORMATIONS OF THE MUSCULOSKELETAL SYSTEM	REMOVAL OF TYMPANOSTOMIC TUBE
754	SOME CONGENITAL MALFORMATIONS OF THE MUSCULOSKELETAL SYSTEM	PARTIAL RHINOPLASTY
754	SOME CONGENITAL MALFORMATIONS OF THE MUSCULOSKELETAL SYSTEM	REPAIR OF CLEFT LIP
754	SOME CONGENITAL MALFORMATIONS OF THE MUSCULOSKELETAL SYSTEM	SUTURE OF THE CAPSULE OR LIGAMENT IN ANOTHER PART OF THE INNER LIMB
754	SOME CONGENITAL MALFORMATIONS OF THE MUSCULOSKELETAL SYSTEM	ACHILLES TENOTOMY
754	SOME CONGENITAL MALFORMATIONS OF THE MUSCULOSKELETAL SYSTEM	HIP ADDUCTOR TENOTOMY
754	SOME CONGENITAL MALFORMATIONS OF THE MUSCULOSKELETAL SYSTEM	TRANSFER OF FLAP PEDUNCULATED GRAFT TO OTHER LOCATIONS
754	SOME CONGENITAL MALFORMATIONS OF THE MUSCULOSKELETAL SYSTEM	VAGOTOMY, NOS
755	OTHER CONGENITAL ANOMALIES OF THE LIMBS	OTHER REMOVAL OF THE JOINT OF THE FOOT AND TOES
755	OTHER CONGENITAL ANOMALIES OF THE LIMBS	OTHER REMOVAL OF THE JOINT OF THE HAND AND FINGERS OF THE HAND
755	OTHER CONGENITAL ANOMALIES OF THE LIMBS	OTHER REMOVAL OF SOFT TISSUES
755	OTHER CONGENITAL ANOMALIES OF THE LIMBS	OTHER LOCAL REMOVAL OR DEMOLITION OF INJURY TO THE JOINT OF THE HAND AND FINGERS OF THE HAND
755	OTHER CONGENITAL ANOMALIES OF THE LIMBS	OTHER LOCAL REMOVAL OR DEMOLITION OF SKIN AND SUBCUTANEOUS LESION OR TISSUE
755	OTHER CONGENITAL ANOMALIES OF THE LIMBS	OTHER REMOVAL, FUSION OR REPAIR OF FINGERS
755	OTHER CONGENITAL ANOMALIES OF THE LIMBS	OTHER SOFT TISSUE INCISION
755	OTHER CONGENITAL ANOMALIES OF THE LIMBS	OTHER INCISION OF THE SOFT TISSUES OF THE HAND
755	OTHER CONGENITAL ANOMALIES OF THE LIMBS	OTHER PARTIAL OSTEOTOMY OF OTHER BONES

755	OTHER CONGENITAL ANOMALIES OF THE LIMBS	OTHER JOINT REPAIR
755	OTHER CONGENITAL ANOMALIES OF THE LIMBS	OTHER SOFT TISSUE SECTION
755	OTHER CONGENITAL ANOMALIES OF THE LIMBS	OTHER SECTION OF THE FEMUR
755	OTHER CONGENITAL ANOMALIES OF THE LIMBS	OTHER HAND TENOPLASTY
755	OTHER CONGENITAL ANOMALIES OF THE LIMBS	OTHER TENOTOMY
755	OTHER CONGENITAL ANOMALIES OF THE LIMBS	OTHER CHANGES IN THE LENGTH OF MUSCLES AND TENDONS
755	OTHER CONGENITAL ANOMALIES OF THE LIMBS	OTHER PLASTIC INTERVENTIONS ON THE HAND
755	OTHER CONGENITAL ANOMALIES OF THE LIMBS	OTHER INTERVENTIONS ON MUSCLES, TENDONS AND HAND BANDS
755	OTHER CONGENITAL ANOMALIES OF THE LIMBS	OTHER INTERVENTIONS ON THE MUSCULOSKELETAL SYSTEM
755	OTHER CONGENITAL ANOMALIES OF THE LIMBS	OTHER SKIN GRAFT ON THE HAND
755	OTHER CONGENITAL ANOMALIES OF THE LIMBS	AMPUTATION AT FOOT LEVEL
755	OTHER CONGENITAL ANOMALIES OF THE LIMBS	AMPUTATION AT HAND LEVEL
755	OTHER CONGENITAL ANOMALIES OF THE LIMBS	AMPUTATION OF TOES
755	OTHER CONGENITAL ANOMALIES OF THE LIMBS	AMPUTATION AND DISARTICULATION OF THE THUMB
755	OTHER CONGENITAL ANOMALIES OF THE LIMBS	AMPUTATION AND DISARTICULATION OF FINGERS
755	OTHER CONGENITAL ANOMALIES OF THE LIMBS	AMPUTATION, NOI
755	OTHER CONGENITAL ANOMALIES OF THE LIMBS	APPLICATION OF EXTERNAL FIXATOR OF RADIUM AND ULNA
755	OTHER CONGENITAL ANOMALIES OF THE LIMBS	ARTHROPLASTY OF THE CARPOCARPAL OR CARPOMETACARPAL JOINT WITHOUT IMPLANTATION
755	OTHER CONGENITAL ANOMALIES OF THE LIMBS	REMOVAL OF OTHER SOFT TISSUE LESIONS OF THE HAND
755	OTHER CONGENITAL ANOMALIES OF THE LIMBS	REMOVAL OF MUSCLE INJURY
755	OTHER CONGENITAL ANOMALIES OF THE LIMBS	LOCAL REMOVAL OF TARSUS AND METATARSAL LESION OR TISSUE
755	OTHER CONGENITAL ANOMALIES OF THE LIMBS	RADICAL REMOVAL OF SKIN LESION
755	OTHER CONGENITAL ANOMALIES OF THE LIMBS	PROGRESS OF PEDUNCULATED FLAP
755	OTHER CONGENITAL ANOMALIES OF THE LIMBS	CLOSURE OF SKIN AND SUBCUTANEOUS TISSUE OF OTHER LOCATIONS
755	OTHER CONGENITAL ANOMALIES OF THE LIMBS	CORRECTION OF SCAR OR RETRACTABLE BRIDLE OF THE SKIN
755	OTHER CONGENITAL ANOMALIES OF THE LIMBS	CORRECTION OF SYNDACTYLY
755	OTHER CONGENITAL ANOMALIES OF THE LIMBS	INTERNAL FIXATION OF OTHER BONE, WITHOUT REDUCTION OF FRACTURE
755	OTHER CONGENITAL ANOMALIES OF THE LIMBS	INCISION OF JOINT CAPSULE, LIGAMENTS OR CARTILAGE OF THE FOOT AND TOES
755	OTHER CONGENITAL ANOMALIES OF THE LIMBS	INCISION OF JOINT CAPSULE, LIGAMENTS OR CARTILAGE OF THE HAND AND FINGERS OF THE HAND
755	OTHER CONGENITAL ANOMALIES OF THE LIMBS	FREE SKIN GRAFT, NOI
755	OTHER CONGENITAL ANOMALIES OF THE LIMBS	FULL THICKNESS SKIN GRAFT ON THE HAND
755	OTHER CONGENITAL ANOMALIES OF THE LIMBS	REGENERATIVE DERMIS GRAFT
755	OTHER CONGENITAL ANOMALIES OF THE LIMBS	BONE GRAFT, LOCATION NOT SPECIFIED
755	OTHER CONGENITAL ANOMALIES OF THE LIMBS	PLASTIC INTERVENTION ON THE HAND WITH ANOTHER GRAFT OR IMPLANT
755	OTHER CONGENITAL ANOMALIES OF THE LIMBS	PLASTIC INTERVENTION ON THE HAND WITH MUSCLE GRAFT OR MUSCLE FASCIA
755	OTHER CONGENITAL ANOMALIES OF THE LIMBS	DERMAL APPENDIX LIGATION
755	OTHER CONGENITAL ANOMALIES OF THE LIMBS	LYSIS OF OTHER ANTERIOR SYNECHIAE
755	OTHER CONGENITAL ANOMALIES OF THE LIMBS	DEVELOPMENT OF ORTHOTIC APPARATUS
755	OTHER CONGENITAL ANOMALIES OF THE LIMBS	CRUENT REDUCTION OF FRACTURE OF THE PHALANGES OF THE HAND, WITH INTERNAL FIXATION
755	OTHER CONGENITAL ANOMALIES OF THE LIMBS	CRUENT REDUCTION OF HIP DISLOCATION
755	OTHER CONGENITAL ANOMALIES OF THE LIMBS	NON CRUENT REDUCTION OF HIP DISLOCATION
755	OTHER CONGENITAL ANOMALIES OF THE LIMBS	REMOVAL OF IMPLANTED DEVICE FROM TARSUS AND METATARSUS
755	OTHER CONGENITAL ANOMALIES OF THE LIMBS	NAIL, NAIL MATRIX OR NAIL PLICA REMOVAL
755	OTHER CONGENITAL ANOMALIES OF THE LIMBS	REPAIR OF HAND DEFECTS
755	OTHER CONGENITAL ANOMALIES OF THE LIMBS	SEQUESTRECTOMY OF OTHER BONES, EXCLUDING FACIAL BONES
755	OTHER CONGENITAL ANOMALIES OF THE LIMBS	TOTAL HIP REPLACEMENT
755	OTHER CONGENITAL ANOMALIES OF THE LIMBS	SUTURE OF THE CAPSULE OR LIGAMENTS OF THE UPPER LIMB
755	OTHER CONGENITAL ANOMALIES OF THE LIMBS	DEFERRED SUTURE OF OTHER TENDONS OF THE HAND
755	OTHER CONGENITAL ANOMALIES OF THE LIMBS	HAND TENOTOMY HAND TENDON SECTION
755	OTHER CONGENITAL ANOMALIES OF THE LIMBS	ACHILLES TENOTOMY
755	OTHER CONGENITAL ANOMALIES OF THE LIMBS	TRANSFER OF FINGERS, EXCEPT FOR THE THUMB
755	OTHER CONGENITAL ANOMALIES OF THE LIMBS	TRANSFER OF FLAP PEDUNCULATED GRAFT TO OTHER LOCATIONS
755	OTHER CONGENITAL ANOMALIES OF THE LIMBS	TRANSPOSITION OR TRANSPLANTATION OF MUSCLES
756	OTHER CONGENITAL MUSCULOSKELETAL ANOMALIES	ELONGATION OF OTHER BONE
756	OTHER CONGENITAL MUSCULOSKELETAL ANOMALIES	OTHER TENUE-LARGE INTESTINAL ANASTOMOSIS
756	OTHER CONGENITAL MUSCULOSKELETAL ANOMALIES	OTHER REMOVAL OF THE MOUTH
756	OTHER CONGENITAL MUSCULOSKELETAL ANOMALIES	OTHER REMOVAL OR DEMOLITION OF INJURY OR BRAIN TISSUE
756	OTHER CONGENITAL MUSCULOSKELETAL ANOMALIES	OTHER CRANIECTOMY
756	OTHER CONGENITAL MUSCULOSKELETAL ANOMALIES	OTHER CRANIOTOMY
756	OTHER CONGENITAL MUSCULOSKELETAL ANOMALIES	OTHER UMBILICAL HERNIORRAPHY
756	OTHER CONGENITAL MUSCULOSKELETAL ANOMALIES	OTHER GASTROSTOMY
756	OTHER CONGENITAL MUSCULOSKELETAL ANOMALIES	OTHER INCISION OF THE SMALL INTESTINE
756	OTHER CONGENITAL MUSCULOSKELETAL ANOMALIES	OTHER TOTAL MANDIBOLECTOMY
756	OTHER CONGENITAL MUSCULOSKELETAL ANOMALIES	OTHER SURGICAL OCCLUSION OF INTRACRANIC VASES
756	OTHER CONGENITAL MUSCULOSKELETAL ANOMALIES	OTHER ORBITOTOMY
756	OTHER CONGENITAL MUSCULOSKELETAL ANOMALIES	OTHER RESECTION OF THE RECTUM
756	OTHER CONGENITAL MUSCULOSKELETAL ANOMALIES	OTHER PARTIAL RESECTION OF THE SMALL INTESTINE
756	OTHER CONGENITAL MUSCULOSKELETAL ANOMALIES	OTHER DIAPHRAGM REPAIR
756	OTHER CONGENITAL MUSCULOSKELETAL ANOMALIES	OTHER REPAIR OF THE ABDOMINAL WALL
756	OTHER CONGENITAL MUSCULOSKELETAL ANOMALIES	OTHER INTESTINE REPAIR
756	OTHER CONGENITAL MUSCULOSKELETAL ANOMALIES	ANOTHER PLASTIC REPAIR OF THE PALATE
756	OTHER CONGENITAL MUSCULOSKELETAL ANOMALIES	OTHER SECTION OF OTHER BONES, EXCLUDING THE FACIAL THOSE
756	OTHER CONGENITAL MUSCULOSKELETAL ANOMALIES	OTHER SUTURE OF THE ABDOMINAL WALL
756	OTHER CONGENITAL MUSCULOSKELETAL ANOMALIES	OTHER PERMANENT TRACHEOSTOMY
756	OTHER CONGENITAL MUSCULOSKELETAL ANOMALIES	OTHER LYSIS OF PERITONEAL ADHESIONS
756	OTHER CONGENITAL MUSCULOSKELETAL ANOMALIES	OTHER CHANGES IN LENGTH OF MUSCLES AND TENDONS
756	OTHER CONGENITAL MUSCULOSKELETAL ANOMALIES	OTHER REPAIRS AND PLASTIC INTERVENTIONS ON THE SPINAL CORD

756	OTHER CONGENITAL MUSCULOSKELETAL ANOMALIES	OTHER REPAIRS AND PLASTIC ON THE LANGUAGE
756	OTHER CONGENITAL MUSCULOSKELETAL ANOMALIES	OTHER INTERVENTIONS ON MUSCLES AND EXTRAOCULAR TENDONS
756	OTHER CONGENITAL MUSCULOSKELETAL ANOMALIES	OTHER INTERVENTIONS ON MUSCLES, TENDONS AND BANDS OF THE HAND
756	OTHER CONGENITAL MUSCULOSKELETAL ANOMALIES	OTHER INTERVENTIONS ON THE SKULL, THE BRAIN AND THE MENINGES
756	OTHER CONGENITAL MUSCULOSKELETAL ANOMALIES	OTHER INTERVENTIONS ON THE DIAPHRAGM
756	OTHER CONGENITAL MUSCULOSKELETAL ANOMALIES	OTHER INTERVENTIONS ON THE LUNG
756	OTHER CONGENITAL MUSCULOSKELETAL ANOMALIES	OTHER INTERVENTIONS ON THE BONES AND FACIAL JOINTS
756	OTHER CONGENITAL MUSCULOSKELETAL ANOMALIES	OTHER INTERVENTIONS ON THE INTESTINE
756	OTHER CONGENITAL MUSCULOSKELETAL ANOMALIES	OTHER TYPES OF SKULL OSTEOPLASTICS
756	OTHER CONGENITAL MUSCULOSKELETAL ANOMALIES	ANASTOMOSIS BETWEEN VENTRICLE, ABDOMINAL CAVITY AND ITS ORGANS
756	OTHER CONGENITAL MUSCULOSKELETAL ANOMALIES	OPENING OF SKULL SUTURES
756	OTHER CONGENITAL MUSCULOSKELETAL ANOMALIES	LAPAROSCOPIC APPENDECTOMY DURING OTHER INTERVENTION
756	OTHER CONGENITAL MUSCULOSKELETAL ANOMALIES	REMOVAL OF INJURY OF THE TENDON BAND OF THE HAND
756	OTHER CONGENITAL MUSCULOSKELETAL ANOMALIES	REMOVAL OF SKULL INJURIES
756	OTHER CONGENITAL MUSCULOSKELETAL ANOMALIES	REMOVAL OR DEMOLITION OF INJURY OR TONGUE TISSUE
756	OTHER CONGENITAL MUSCULOSKELETAL ANOMALIES	REMOVAL OR DEMOLITION OF INJURY OR TISSUE OF ABDOMINAL WALL OR UMBILICUS
756	OTHER CONGENITAL MUSCULOSKELETAL ANOMALIES	LOCAL REMOVAL OR DEMOLITION OF INJURY OR TISSUE OF THE TRACHEA
756	OTHER CONGENITAL MUSCULOSKELETAL ANOMALIES	CLOSURE OF ANOTHER FISTULA OF THE TRACHEA
756	OTHER CONGENITAL MUSCULOSKELETAL ANOMALIES	CORRECTION OF BLEPHAROPTOSIS WITH OTHER TECHNIQUES
756	OTHER CONGENITAL MUSCULOSKELETAL ANOMALIES	CORRECTION OF PALATOSCHISIS
756	OTHER CONGENITAL MUSCULOSKELETAL ANOMALIES	RIGHT HEMICOLECTOMY
756	OTHER CONGENITAL MUSCULOSKELETAL ANOMALIES	GINGIVOPLASTY
756	OTHER CONGENITAL MUSCULOSKELETAL ANOMALIES	TEMPORARY ILEOSTOMY
756	OTHER CONGENITAL MUSCULOSKELETAL ANOMALIES	INCISION OF THE PALATE
756	OTHER CONGENITAL MUSCULOSKELETAL ANOMALIES	BONE GRAFT ON FACIAL BONES
756	OTHER CONGENITAL MUSCULOSKELETAL ANOMALIES	PLASTIC INTERVENTION FOR THE REDUCTION OF WIDTH
756	OTHER CONGENITAL MUSCULOSKELETAL ANOMALIES	EXPLORATIVE LAPARATOMY
756	OTHER CONGENITAL MUSCULOSKELETAL ANOMALIES	LYSIS OF ADHESION OF THE NOSE
756	OTHER CONGENITAL MUSCULOSKELETAL ANOMALIES	INTRAABDOMINAL MANIPULATION OF THE INTESTINE, NOT OTHERWISE SPECIFIED
756	OTHER CONGENITAL MUSCULOSKELETAL ANOMALIES	TOTAL OSTEOTOMY OF OTHER FACIAL BONES WITH CONTEMPORARY RECONSTRUCTION
756	OTHER CONGENITAL MUSCULOSKELETAL ANOMALIES	PLICATION OF THE DIAPHRAGM
756	OTHER CONGENITAL MUSCULOSKELETAL ANOMALIES	RESECTION OF THE EXTERIORIZED SEGMENT OF THE SMALL INTESTINE
756	OTHER CONGENITAL MUSCULOSKELETAL ANOMALIES	MULTIPLE SEGMENTARY RESECTION OF THE SMALL INTESTINE
756	OTHER CONGENITAL MUSCULOSKELETAL ANOMALIES	REVIEW OF THE TRACHEOSTOMY
756	OTHER CONGENITAL MUSCULOSKELETAL ANOMALIES	RECONSTRUCTION OF THE PENIS
756	OTHER CONGENITAL MUSCULOSKELETAL ANOMALIES	FACE FRACTURE REDUCTION, SAI
756	OTHER CONGENITAL MUSCULOSKELETAL ANOMALIES	INCRUENT REDUCTION OF FEMUR FRACTURE WITHOUT INTERNAL FIXATION
756	OTHER CONGENITAL MUSCULOSKELETAL ANOMALIES	INCRUENT FRACTURE REDUCTION OF OTHER SPECIFIED BONE, WITH INTERNAL FIXATION
756	OTHER CONGENITAL MUSCULOSKELETAL ANOMALIES	REMOVAL OF DEVICE IMPLANTED FROM OTHER BONES
756	OTHER CONGENITAL MUSCULOSKELETAL ANOMALIES	REPAIR OF ANOTHER HERNIA OF THE ANTERIOR ABDOMINAL WALL
756	OTHER CONGENITAL MUSCULOSKELETAL ANOMALIES	REPAIR OF ANOTHER HERNIA OF THE ANTERIOR ABDOMINAL WALL WITH PROSTHESIS
756	OTHER CONGENITAL MUSCULOSKELETAL ANOMALIES	REPAIR OF DIAPHRAGMATIC HERNIA THROUGH THE THORAC, NOS
756	OTHER CONGENITAL MUSCULOSKELETAL ANOMALIES	REPAIR OF DIAPHRAGMATIC HERNIA, BY ABDOMEN
756	OTHER CONGENITAL MUSCULOSKELETAL ANOMALIES	PARASTERNAL HERNIA REPAIR
756	OTHER CONGENITAL MUSCULOSKELETAL ANOMALIES	REPAIR OF HERNIA ON INCISION WITH PROTHESIS
756	OTHER CONGENITAL MUSCULOSKELETAL ANOMALIES	REPAIR OF GASTROSCHISIS
756	OTHER CONGENITAL MUSCULOSKELETAL ANOMALIES	REPAIR OF HYPOSPADIA OR EPISPADIA
756	OTHER CONGENITAL MUSCULOSKELETAL ANOMALIES	REPAIR OF SPINAL MENINGOCELE
756	OTHER CONGENITAL MUSCULOSKELETAL ANOMALIES	LIP CLEFT REPAIR
756	OTHER CONGENITAL MUSCULOSKELETAL ANOMALIES	MONOLATERAL REPAIR OF INDIRECT INGUINAL HERNIA
756	OTHER CONGENITAL MUSCULOSKELETAL ANOMALIES	SUTURE OF DIAPHRAGM LACERATION
756	OTHER CONGENITAL MUSCULOSKELETAL ANOMALIES	TRANSFER OF PEDUNCULATED CLIP GRAFT TO OTHER LOCATIONS
757	CONGENITAL ANOMALIES OF THE INTEGUMENT	OTHER LOCAL REMOVAL OR DEMOLITION OF INJURY OR SKIN AND SUBCUTANEOUS TISSUE
757	CONGENITAL ANOMALIES OF THE INTEGUMENT	OTHER INTERVENTIONS ON THE SKIN AND SUBCUTANEOUS TISSUE
757	CONGENITAL ANOMALIES OF THE INTEGUMENT	REMOVAL OR DEMOLITION OF OTHER INJURY OF THE OUTER EAR
757	CONGENITAL ANOMALIES OF THE INTEGUMENT	RADICAL REMOVAL OF SKIN INJURY
757	CONGENITAL ANOMALIES OF THE INTEGUMENT	CORRECTION OF BLEPHAROPTOSIS WITH OTHER TECHNIQUES
7586	GONADIC DYSGENESIA	REMOVAL OF BOTH OVARIES IN THE SAME INTERVENTION
7590	ANOMALIES OF THE SPLEEN	REPAIR AND PLASTIC INTERVENTIONS ON THE SPLEEN
7592	ANOMALIES OF OTHER ENDOCRINE GLANDS	REMOVAL OF THE TRACT OR TIREOGLOSSUS DUCT
7593	SITUS INVERSUS	OPEN HEART PLASTIC VALVE OF THE TRICUSPID VALVE WITHOUT REPLACEMENT
7593	SITUS INVERSUS	PULMONARY SYSTEMIC ARTERIAL ANASTOMOSIS
7593	SITUS INVERSUS	TOTAL CORRECTION OF FALLOT TETRALOGY
7596	OTHER AMARTOMAS, NOT ELSEWHERE CLASSIFIED	CLOSURE OF SKIN AND SUBCUTANEOUS TISSUE OF OTHER LOCATIONS

Table 9: Unspecified CAs	
ICD9-CM	**Pathology**
7429	UNSPECIFIED ABNORMALITIES OF THE BRAIN, SPINAL CORD AND NERVOUS SYSTEM
7439	UNSPECIFIED ABNORMALITIES OF THE EYE
7443	UNSPECIFIED EAR ABNORMALITIES
7449	UNSPECIFIED FACIAL AND NECK ABNORMALITIES
7459	NOT SPECIFIED DEFECT IN SEPTAL CLOSURE
7469	UNSPECIFIED HEART ANOMALY
7479	UNSPECIFIED ABNORMALITIES OF THE CIRCULATORY SYSTEM
7489	UNSPECIFIED ABNORMALITIES OF THE RESPIRATORY SYSTEM
7509	UNSPECIFIED ABNORMALITIES OF THE UPPER ALIMENTARY TRACT
7519	UNSPECIFIED ABNORMALITIES OF THE DIGESTIVE SYSTEM
7529	UNSPECIFIED ABNORMALITIES OF THE GENITAL ORGANS
7558	OTHER SPECIFIED ANOMALIES OF UNSPECIFIED LIMB
7559	UNSPECIFIED ANOMALIES OF UNSPECIFIED LIMB
7569	OTHER AND UNSPECIFIED MUSCULOSKELETAL SYSTEM ABNORMALITIES
7579	UNSPECIFIED INTEGUMENT ANOMALIES
7599	CONGENITAL ANOMALIES, NOT SPECIFIED
74259	OTHER UNSPECIFIED SPINAL CORD ABNORMALITIES
74400	UNSPECIFIED EAR ABNORMALITIES WITH HEARING IMPAIRMENT
74429	OTHER UNSPECIFIED EAR ABNORMALITIES
74489	OTHER UNSPECIFIED FACIAL AND NECK ABNORMALITIES
74560	ENDOCARDIAL CUSHION DEFECT, OF UNSPECIFIED TYPE
74609	OTHER UNSPECIFIED CONGENITAL ABNORMALITIES OF THE HEART
74689	OTHER UNSPECIFIED ABNORMALITIES OF THE HEART
74729	OTHER UNSPECIFIED CONGENITAL ABNORMALITIES OF THE CIRCULATORY SYSTEM
74740	ANOMALIES OF LARGE VENOUS VESSELS, NOT SPECIFIED
74760	ANOMALY OF THE PERIPHERAL VASCULAR SYSTEM, OF UNSPECIFIED SITE
74789	OTHER UNSPECIFIED ABNORMALITIES OF THE CIRCULATORY SYSTEM
74860	LUNG ABNORMALITIES, NOT SPECIFIED
74869	UNSPECIFIED CONGENITAL ANOMALIES OF THE RESPIRATORY SYSTEM
75010	TONGUE ANOMALIES, NOT SPECIFIED
75019	OTHER UNSPECIFIED CONGENITAL ABNORMALITIES OF THE UPPER ALIMENTARY TRACT
75160	UNSPECIFIED ABNORMALITIES OF THE GALLBLADDER, BILE DUCTS AND LIVER
75210	UNSPECIFIED ABNORMALITIES OF FALLOPIAN TUBES AND WIDE LIGAMENTS
75240	UNSPECIFIED ABNORMALITIES OF THE CERVIX, VAGINA AND FEMALE EXTERNAL GENITALIA
75320	UNSPECIFIED OBSTRUCTIVE DEFECT OF THE PELVIS OF THE KIDNEY AND URETER
75470	UNSPECIFIED CLUBFOOT
75479	OTHER UNSPECIFIED FOOT MALFORMATIONS
75489	OTHER UNSPECIFIED NON-TERATOGENIC ABNORMALITIES
75510	LIMB DEFECT, MULTIPLE AND UNSPECIFIED SITES
75550	UPPER LIMB ANOMALIES, NOT SPECIFIED
75559	OTHER UNSPECIFIED UPPER LIMB ABNORMALITIES
75560	UNSPECIFIED LOWER LIMB ANOMALIES
75569	OTHER UNSPECIFIED LOWER LIMB ABNORMALITIES
75610	COLUMN ANOMALIES, NOT SPECIFIED
75670	ABDOMINAL WALL ANOMALY, NOT SPECIFIED
75689	OTHER UNSPECIFIED ABNORMALITIES OF MUSCLES, TENDONS, FASCIA AND CONNECTIVE TISSUE
75739	OTHER UNSPECIFIED SKIN ABNORMALITIES
75989	OTHER UNSPECIFIED ANOMALIES
7539	UNSPECIFIED ABNORMALITIES OF THE URINARY SYSTEM

Table 10: Results of the EUROlinkCAT ACM Working Group on malformations - clinically validated malformations to add to algorithm Table 7	
EYE, EAR, FACE AND NECK	
Q11.0 Q11.1	ANOPHTHALMOS
Q13.0	COLOBOMA OF IRIS
Q13.1	ABSENCE OF IRIS
Q15.0	CONGENITAL GLAUCOMA
Q30.2	FISSURED, NOTCHED AND CLEFT NOSE
RESPIRATORY	
Q33.3	AGENESIS OF LUNG
GASTROINTESTINAL	
Q43.1	HIRSCHSPRUNG'S DISEASE
GENITAL	
Q51.0	AGENESIS AND APLASIA OF UTERUS
Q52.0	CONGENITAL ABSENCE OF VAGINA
URINARY	
Q62.4	AGENESIS OF URETER
Q63.10	HORSESHOE KIDNEY
Q63.0	ACCESSORY KIDNEY
Q64.0	EPISPADIAS
Q64.1	EXSTROPHY OF URINARY BLADDER
MUSCULO SKELETAL	
Q69.0	ACCESSORY FINGER(S)
Q69.1	ACCESSORY THUMB(S)
Q69.2	ACCESSORY TOE(S)
Q76.40	CONGENITAL ABSENCE OF VERTEBRA(E)
Q76.41	CONGENITAL ANOMALIES OF SACRAL VERTEBRAE
	SACRAL AGENESIS
Q77.4	ACHONDROPLASIA
Q79.0	CONGENITAL DIAPHRAGMATIC HERNIA
Q79.2	EXOMPHALOS / OMPHALOCELE
Q79.3	GASTROSCHISIS
OTHER	
Q84.80	APLASIA CUTIS CONGENITA