The value of device identifiers for cardiac implantable electronic devices – A data quality assessment of administrative hospital data in Portugal

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Introduction

Real-world data offer the opportunity to evaluate the safety and effectiveness of medical devices (MD)[1]. Standardized terminology for describing MDs is critical for their post-market assessment since it enables safe and unambiguous identification of MD[2]. Cardiac Implantable Electronic Devices (CIED) utilization may be traceable in administrative hospital data in Portugal through the International Classification of Diseases and through a Device Identifier (DI). Previous studies show that it is feasible to include DI for MD in electronic health records and administrative hospital data and that its consistent implementation holds excellent opportunities to assess real-world use of brand-specific devices[3,4]. Knowledge of brand and model specification could improve health technologies assessment with administrative hospital data in Portugal.

Objective

To assess the quality and value of DI for CIEDs, comparing the utilization of the different coding system available in the Portuguese administrative hospital data.

Methods

Retrospective study of hospital discharges with an insertion or replacement of CIED occurring during 2015-2016. When possible, CIED were subdivided according to the type of generator (i.e., pacemaker (PM), cardiac resynchronization therapy (CRT), implantable cardioverter-defibrillator (ICD)) and leads. We identified hospital episodes with different categories of CIED using DI and procedure codes according to the international classification of diseases, 9th revision, clinical modification (ICD-9-CM). The number of discharges documenting the use of devices was summarized and compared across classification systems. The sensitivity and positive predictive value of DIs were calculated using the ICD-9-CM, as the gold standard. The top implanted MD models of discharges with a match between coding systems were identified and characterized to further understand practice patterns across hospitals. Descriptive statistics of discharges of patients implanted with a CIED were summarized by year, identifying the main characteristics of the sample .The number of discharges identified with the different classification systems (DI vs. ICD-9-CM) were compared by CIED category. The unit of analysis was the hospital discharge.

Results and Discussion

We identified 20 006 discharges occurring in 41 hospitals (84% inpatient). Of these, 19 985 (100%) were identified through ICD-9-CM codes and only 2810 (14%) through DI.

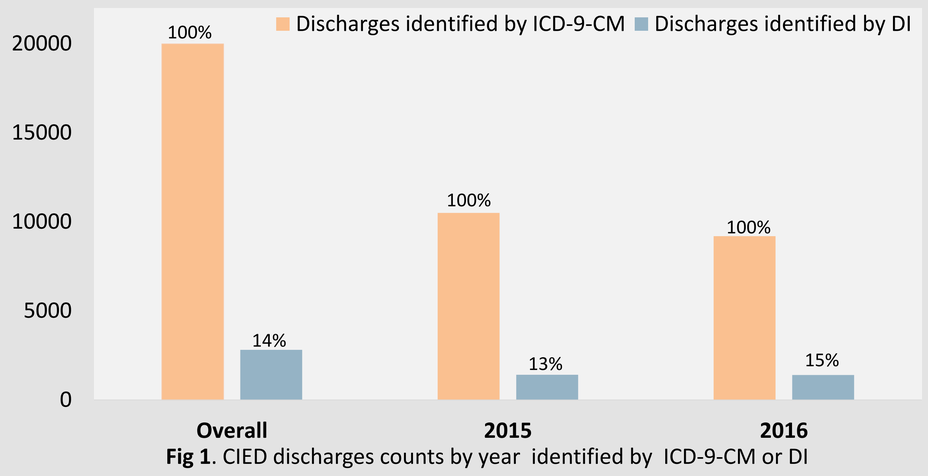

Fig 1. CIED discharges counts by year identified by ICD-9-CM or DI

The sensitivity of DI to identify CIED discharges was lower than 35% regardless of the subtype of CIED considered which indicates little usefulness of the DI to identify CIED discharges, when compared with the ICD-9-CM. The overall PPV was generally high (>0.8) except for CRT-P and Leads subgroup analysis. There were 230 distinct DI in the data, representing 169 distinct CIED models. The price of CIED varies across hospitals, and variability is larger in more costly devices.

	Overall N = 20006	2015 N = 10500	2016 N = 9506
Discharges identified by ICD-9-CM			
Any CIED	19985 (100%)	10494 (100%)	9491 (100%)
PM	16351 (82%)	8624 (82%)	7727 (81%)
CRT	1803 (9.0%)	927 (8.8%)	876 (9.2%)
CRT-P	473 (2.4%)	272 (2.6%)	201 (2.1%)
CRT-D	1330 (6.6%)	655 (6.2%)	675 (7.1%)
CDI	1562 (7.8%)	815 (7.8%)	747 (7.9%)
Leads	12548 (63%)	6611 (63%)	5937 (62%)
Discharges identified by DI			
Any CIED	2810 (14%)	1412 (13%)	1398 (15%)
PM	1302 (6.5%)	600 (5.7%)	702 (7.4%)
CRT	376 (1.9%)	177 (1.7%)	199 (2.1%)
CRT-P	54 (0.3%)	22 (0.2%)	32 (0.3%)
CRT-D	322 (1.6%)	155 (1.5%)	167 (1.8%)
CDI	657 (3.3%)	355 (3.4%)	302 (3.2%)
Leads	1234 (6.2%)	747 (7.1%)	487 (5.1%)

Table 1. CIED discharges counts by year and category identified by ICD-9-CM or DI

		ICD-9-CM					
		Pacemaker	**CRT-P**	**CRT-D**	**CDI**	**Leads**	**Total**
DI	**PM**	1278 (98%)	0 (0%)	1 (<0.1%)	9 (0.7%)	1103 (85%)	1302 (100%)
	CRT-P	11 (20%)	31 (57%)	9 (17%)	9 (17%)	10 (19%)	54 (100%)
	CRT-D	2 (0.6%)	1 (0.3%)	293 (91%)	28 (8.7%)	8 (2.5%)	322 (100%)
	CDI	4 (0.6%)	16 (2.4%)	88 (13%)	549 (84%)	7 (1.1%)	657 (100%)
	Leads	600 (49%)	28 (2.3%)	341 (28%)	260 (21%)	614 (50%)	1234 (100%)

Table 2. Validation of CIED category identified using DI codes against ICD-9-CM codes – Positive predictive value

		ICD-9-CM				
		Pacemaker	**CRT-P**	**CRT-D**	**CDI**	**Leads**
DI	**PM**	1278 (7.8%)	0 (0%)	1 (<0.1%)	9 (0.6%)	1103 (8.8%)
	CRT-P	11 (<0.1%)	31 (6.6%)	9 (0.7%)	9 (0.6%)	10 (<0.1%)
	CRT-D	2 (<0.1%)	1 (0.2%)	293 (22%)	28 (1.8%)	8 (<0.1%)
	CDI	4 (<0.1%)	16 (3.4%)	88 (6.6%)	549 (35%)	7 (<0.1%)
	Leads	600 (3.7%)	28 (5.9%)	341 (26%)	260 (17%)	614 (4.9%)
	Total	16351 (100%)	473 (100%)	1330 (100%)	1562 (100%)	12548 (100%)

Table 3. Validation of CIED category identified using DI codes against ICD-9/10-CM codes – Sensitivity

Our results show that there was a high discrepancy in the number of discharges that were identified with the different systems of coding, with the number of discharges identified through ICD-9-CM being much higher compared to those identified through DI. This fact constitutes a major gap in the database under study since the consistent use of DI to identify CIED would offer an excellent opportunity for the assessment of health technologies by providing important and specific characteristics of each device, such as the brand, model and price.

Conclusions

Compared to ICD-9-CM, DIs are not reliable to identify CIED discharges. However, our findings demonstrate the inclusion of detailed information on MDs would enrich the NHMD beyond its primary goal of hospital funding, allowing for the potential reuse of data of brand-specific MDs for health technology assessment.

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