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EPR-based, quality-related process parameters: a nationwide assessment

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Abstract. The aim of the study was to determine whether or not primary care EPR-based data can be used to measure specific process parameters that can then, in turn, be used to assess the quality of care provided to chronic patients. We analysed data from a large research network that collects data from all Belgian GP practices through both manual and automatic extraction procedures. We built a number of quality-related process parameters and observed the concordance of our results with two external databases: a nationwide reimbursement database and a regional EPR-based network. We found that only the automatic data extraction method was suitable for building process parameters. The current research network may lead to an underestimation of the quality of care processes. We suggested ways to improve this network.

Keywords: computerised patient record, primary healthcare, data collection, quality indicators.

Introduction

In many countries, higher life expectancy is associated with increased prevalence of chronic diseases. Coping with this requires the provision of more integrated, evidence-based, multidisciplinary, patient-centred care, for instance using Wagner's chronic care model (CCM)[1]. The ultimate goal for this reengineering of the care process is improved care. Monitoring the quality of care is therefore of the utmost importance.

In 2009, the National Institute for Health and Disability Insurance (NIHDI) in Belgium launched the ambulatory care trajectories. These were the first nationwide implementation of the CCM for (subgroups of) patients suffering from Type 2 diabetes mellitus (DM-2) and chronic renal failure (CRF). By early 2013, over 50,000 patients had already been enrolled in the programme. The NIHDI also funded the ACHIL project (Ambulatory Care Health Information Laboratory), whose goal was to assess the effectiveness of the programme at improving quality of care, in terms of processes and outcomes. ACHIL uses data from general practitioners' Electronic Patient Records.

The use of routinely collected general practice data to assess quality of care remains challenging [2, 3]. In Belgium, more than 17 different software systems are currently used by nearly 10,000 practicing General Practitioners (GPs), and these are connected to different health data communication networks, such as regional networks, shared EPRs (Electronic Patient Records), and EPR-based research networks [4].

Process parameters are often used to assess quality of care [5-7]. In this paper, we investigate whether a large-scale research network that collects EPR-based data from GPs is suitable for measuring specific quality-related process parameters.

1. Methods

For this study, we used the limited mandatory ACHIL data that GPs must send for all their Care Trajectory (CT) patients. For DM-2 CT patients, the data parameters include age, gender, weight, height, systolic and diastolic blood pressure, LDL-cholesterol, and HbA1c. For CRF CT patients, the data parameters include age, gender, eGFR, systolic and diastolic blood pressure, PTH (parathormone), Hb (hemoglobin), and Creat (creatinin). Data was sent to the research centre in 2012.

To build the quality-related process parameters, we counted the number of measurements for each data parameter made between January 2010 and December 2011, for every patient that began a CT prior to 1 January 2011. For each parameter, we identified quality-related targets and computed the percentage of patients achieving these targets. For example, we computed the percentage of DM-2 CT patients with three or more HbA1c measurements/year during the period studied.

To identify the targets, we primarily used the follow-up plans for CT patients endorsed by the NIHDI and developed by the Belgian National Council for Quality Promotion. We also used national and international guidelines, reports, scientific papers, and advice from experts. Some intermediate (less constraining) targets were also analysed. Targets were defined according to the eligible patient populations described by the NIHDI. For DM-2 CT, this mainly included patients receiving 1 or 2 insulin injections or patients for whom starting insulin treatment was being considered. For CRF CT, it included mainly patients with eGFRs lower than 45 ml/min./1.73m² (see www.trajetdesoins.be).

When GPs were sending data to the research centre in 2012, they could choose either to manually enter one or more data measurements into a specific, secured ACHIL web application (the "manual method") or to perform an automatic data extraction from their EPR (the "upload method") [8]. We had to tackle various key issues: privacy protection and secondary IDs management, quality control procedures, standardized data format, defining validity dates and default values of the data, providing efficient support (documentation, help desk) to all the software producers and GPs, meeting technical and political constraints related to a nationwide application.

In this study, we compared the quality-related process parameter values calculated using the manual data collection method with those calculated using the automatic data extraction method (number of measurements/ number of years in the observed period). We then used triangulation [9] to observe the concordance of our results with two available external databases: the IMA and Intego databases.

The IMA database is a national reimbursement database that includes all reimbursed medical and paramedical interventions for all Belgian citizens with health insurance. Usable data for this study relates to the year 2010 and to all the patients starting a CT before 1 January 2010.

Intego is a regional EPR-based network of selected GPs. It has been operating since 1997 and currently consists of 97 GPs representing over 248,000 patients. Usable data for this study relates to the year 2011 and to CT patients registered in Intego and starting their CT before 31 December 2011.

2. Results

In the ACHIL database, we found 9792 patients who started a DM-2 CT before 1 January 2011. The manual method yielded 74,971 data measurements for 9000 patients for the period studied [2010-2011]. For 12 patients, no data was received for this period. The upload method yielded 28,981 data measurements for 792 patients.

We also found 7887 patients who started a CRF CT before 1 January 2011. The manual method yielded 56,301 data measurements for 7331 patients for the period studied [2010-2011]. For 6 patients, no data was received for this period. The upload method yielded 28,343 data measurements for 556 patients.

Table 1 shows the percentages of CT patients achieving several targets for both methods. The target "at least 1" measurement during the 2-year period identifies the percentage of patients with missing parameters. The target "≥ 1/year" shows the ability of each method to collect several measurements for a parameter (at least 2 measurements during the 2-year period). For each parameter, the most constraining targets are the quality-related targets.

Table 1. Percentage of CT patients achieving targets, by parameter and data collection method

DM-2 Care trajectory	Targets (2-year period)	Data collection		CRF Care trajectory	Targets (2-year period)	Data collection	
		Manual N= 9000	Upload N= 792			Manual N= 7331	Upload N= 556
HbA1C	at least 1	99,0%	83,5%	**eGFR (measured)**	at least 1	93,5%	56,8%
	≥ 1/year	20,8%	70,8%		≥ 1/year	16,3%	48,0%
	≥ 3/year	1,6%	36,1%		≥ 3/year	1,2%	30,2%
Syst BP	at least 1	99,2%	90,0%	**Creat**	at least 1	94,1%	82,0%
	≥ 1/year	21,6%	75,3%		≥ 1/year	16,8%	70,3%
	≥ 3/year	1,9%	47,2%		≥ 3/year	1,4%	40,8%
Diast BP	at least 1	99,2%	90,0%	**Syst BP**	at least 1	99,1%	86,2%
	≥ 1/year	21,6%	75,3%		≥ 1/year	18,3%	70,1%
	≥ 3/year	1,9%	47,0%		≥ 3/year	1,6%	45,5%
Weight	at least 1	96,1%	80,2%	**Diast BP**	at least 1	99,0%	86,2%
	≥ 1/year	19,5%	57,3%		≥ 1/year	18,3%	70,0%
	≥ 3/year	1,2%	27,0%		≥ 3/year	1,6%	45,5%
LDL cholest	at least 1	94,7%	71,1%	**PTH**	at least 1	64,3%	44,2%
	≥ 1/year	17,2%	49,0%		≥ 1/year	7,3%	25,2%
BMI (calculated)	at least 1	88,2%	67,8%	**Hb**	at least 1	90,9%	85,1%
	≥ 1/year	18,2%	49,6%		≥ 1/year	16,2%	75,4%
	≥ 3/year	1,2%	23,7%				

N: number of patients; Targets = number of measurements during a 2-year period

Table 2 shows the percentages of patients achieving some of the targets within the ACHIL databases (upload method) and within the two external databases. For the IMA database we used available data for the year 2010, for 3886 patients who started their CT before 1 January 2010. For the Intego database, we used available data for the year 2011, for 271 patients who started their CT before 31 December 2011. Only parameters that were available in one of the two external databases were considered.

Table 2. Percentage of CT patients achieving targets, by parameter and data source

Care Trajectory	Parameter	Target (number of measurements)	ACHIL (upload) [2010-2011] (792 patients)	Intego 2011 (271 patients)	IMA 2010 (3886 patients)
DM-2	HbA1C	≥ 1/year	70,8%	96,0%	97,0%
		≥ 3/year	36,1%	71,0%	67,0%
	Syst BP	≥ 1/year	75,3%	85,0%	n.a.
		≥ 3/year	47,2%	62,0%	n.a.
	Weight	≥ 1/year	57,3%	66,0%	n.a.
		≥ 3/year	27,0%	30,0%	n.a.
	LDL cholest	≥ 1/year	49,0%	91,0%	92,0%
			(556 patients)	(225 patients)	(5510 patients)
CRF	Creat	≥ 1/year	70,3%	96,0%	94,0%
		≥ 3/year	40,8%	65,0%	79,0%
	Syst BP	≥ 1/year	70,1%	82,0%	n.a.
		≥ 3/year	45,5%	63,0%	n.a.
	PTH	≥ 1/year	25,2%	n.a.	78,0%
	Hb	≥ 1/year	75,4%	94,0%	97,0%

3. Discussion

For the manual data collection method, we found a low level of missing data, i.e. low numbers of patients with no measurements for a given parameter (see Table 1), with the exception of BMI, Hb, and PTH, which showed 12%, 9 %, and 36% missing values, respectively. However, for each parameter, fewer than 22% of the patients had more than one value. A longitudinal process analysis would require several manual data collections, according to the targets (e.g. three times a year) or would require GPs to register several values during each data collection. For several parameters, this seems hardly acceptable for stakeholders. Manual data collection does not, therefore, seem suitable for building retrospective time series.

For all parameters (see Table 1), we observed more missing values for the upload procedure (up to 56% missing values for PTH). This could partly be explained by the low quality of the various EPR extraction modules developed by the software producers. There is no strong centralised quality control procedure for these modules. Another possible explanation is the non-communication of some results. For example, the results of a PTH analysis ordered by a specialist could be communicated to the specialist but not to the GP. We should also consider electronic data sent to the GP but not automatically recorded in the EPR and data not manually recorded by the GP. Data is not always adequately recorded in the EPR [2, 5].

The upload procedure allows retrospective time series to be built to support process analysis (see Table 1). However, this could lead to an underestimation of the number of patients achieving the targets of care processes (see Table 2). The high numbers of missing values may partly explain this underestimation. The Intego (EPR-based) network, which is based on selected GPs all using the same software system, highlights potential improvements in the national ACHIL (EPR-based) network.

Triangulation may increase confidence in research data and provide a clearer understanding of a problem and an effective way of developing timely

recommendations [9]. However, it is important that we bear in mind the limitations of this approach in the context of our study. The external databases used relate to different groups of GPs and CT patients and to different time periods. As a network, Intego is not representative of all GPs, while IMA is restricted to reimbursed interventions.

This paper deals with assessing the effectiveness of care processes, which is on the agenda in many countries [5-7]. However, other aspects of care quality should also be considered, such as the effectiveness of health outcomes, efficiency, satisfaction of patients, and satisfaction of health professionals [10].

4. Conclusions

Our study showed that, in Belgium, a large, nationwide, primary care, EPR-based research network can be used to measure process parameters that could, in turn, be used to assess some aspects of care quality. This network should be based on automatic extraction from EPRs.

We highlighted the need to improve the current research network and suggested the reinforcement of quality control procedures for data extraction modules, as well as improvements to data communication and registration within the EPR. Careful monitoring of these changes to the research network will be necessary in the future, in order to be able to differentiate between improvements in care quality that are due to care process reengineering and improvements in the information system itself.

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