Challenges of Trustable AI and Added-Value on Health B. Séroussi et al. (Eds.) © 2022 European Federation for Medical Informatics (EFMI) and IOS Press. This article is published online with Open Access by IOS Press and distributed under the terms of the Creative Commons Attribution Non-Commercial License 4.0 (CC BY-NC 4.0). doi:10.3233/SHTI220513

Assessment of Health Service Quality Through Electronic Health Record – A Scoping Review

Hanna von GERICH^{a,b1} and Laura-Maria PELTONEN^b ^a Turku University Hospital, Turku, Finland ^bDepartment of Nursing Science, University of Turku, Turku, Finland

Abstract. The World Health Organization defines, that high quality health services should be effective, safe, people-centered, timely, equitable, integrated, and effective. This requires systematic quality assessment. The aim of this scoping review was to explore how electronic health records (EHRs) have been used to assess quality of health services using the WHO criteria. A total of 4247 records were obtained whereof 8 studies were included in the review. Research showed that EHRs were used to evaluate safety, performance and care processes. EHRs were regarded as an applicable real-world data source, highlighting the importance of consistency and standardised terminologies. Use of EHR data is limited to its representation of the real world and current evaluation systems have limited quality criteria, diverse definitions and they use only structured data. Future research should explore possibilities of natural language processing methods and include narrative EHR information for a more a comprehensive view of service quality assessment.

Keywords. Care quality, EHR, health service research, quality assessment

1. Introduction

The World Health Organization (WHO) defines quality of care as "the degree to which health services for individuals and populations increase the likelihood of desired health outcomes". Health services should be effective, safe, people-centered, timely, equitable, integrated and efficient to meet expected standards [1]. However, determining the quality of health services is a multifaceted task, which requires validated instruments and systematic measurement, as well as systems thinking [2]. Furthermore, the service quality needs to be evaluated from different perspectives on individual, departmental, organisational, national and international levels.

Health care system quality of care may traditionally be explored through the Donabedian model, which divides essential elements in structures, processes and outcomes, where the structure includes the context of care delivery, processes the actions taken in care provision, and outcomes the impact of provided care on individuals [3]. It is the responsibility of the care provider to ensure the highest possible standard of services based on service users' needs and monitoring delivered care becomes key in quality improvement. The WHO suggests a process for building a strategy for quality,

¹ Corresponding Author, Hanna von Gerich, Department of Nursing Science 20014 University of Turku, Turku, Finland.; E-mail: hanna.m.vongerich@utu.fi.

which includes seven elements related to an initial analysis, a strategy development, and an implementation phase [4].

Healthcare digitalisation provides an opportunity for semiautomated comprehensive health service quality evaluation based on large and diverse data sets. National, regional and organisational databases are used to monitor different aspects of quality in health care [5]. Electronic health records (EHR), containing multidisciplinary documentation from the point of care may be seen as vast collections of holistic key data regarding individuals and their care within an organisation. Hence, EHRs provide an amazing and almost real-time opportunity for quality assessment and improvement. However, a recent study in the USA showed that there are concerns about EHR-based quality measures related to data access, standardisation of data elements and cost regarding integration between different systems [6]. Hence, the aim of this scoping review was to explore how EHRs have been used to assess health service quality, defined by the WHO criteria [1].

2. Methods

This scoping review was undertaken following Prisma-ScR Cheklist [7] and the framework by Arksey and O'Malley [9]. The following research question were identified:

- 1) What health service quality related factors have been assessed and how from EHRs?
- 2) What strengths and weaknesses are associated with utilising EHR data for assessing health service quality?
- 3) What are the next steps in utilising EHRs in health service quality assessment as reported by researchers?

2.1. Identifying Relevant Studies

For this scoping review, the PubMed, CINAHL (Ebsco) and Embase databases were searched using the search phrase: ((effective* OR safe* OR People-cent* OR timel* OR Equitab* OR Integrat* OR efficien*) AND ("health service") AND (EHR OR MHR OR note* OR record*)). Applicable MeSH terms including "Electronic Health Records"[Mesh] and "Medical Records"[Mesh] in PubMed and Subject headings (MH "Electronic Health Records+"), (MH "Medical Records+"), (MH "Patient Record Systems+"), (MH "Nursing Records") and (MH "Documentation+") in CINAHL were added to the searches. The search was done in January 2022. No time limits were used.

2.2. Study Selection

The studies included in this review were peer-reviewed scientific articles written in English, assessing the applicability of one or more WHO criteria for quality health services in quality evaluation using electronic health records. We excluded studies that were not relevant to nursing, manual records, research protocols and literature reviews.

2.3. Charting the Data and Collating, Summarising and Reporting the Results

Studies were downloaded to the Rayyan web-tool for systematic reviews (rayaan.ai), where duplicates were removed, and title and abstract screening was performed. The screening was performed by two researchers, with uncertainties discussed together. The following data were extracted: Author(s), publication details, study location, aim of the study, method of study and data extraction, analysed data, scientific disciplines involved in the study, strengths and limitations in utilising EHR data and next steps in utilising EHR in health service quality assessment. Extracted data were collected to a spreadsheet and analysed following the principles of content analysis [9].

3. Results

A total of 4247 records were obtained, with PubMed providing 2029, CINAHL 1296 and Embase 922 results. After the removal of 756 duplicates, 3491 articles' titles and were screened, followed by abstract screening of 380 records. Altogether 31 full text articles were assessed for eligibility, resulting in 8 descriptive studies being included in the review. The studies were conducted between 2010 and 2021 in Great Britain [10-14], Australia [15-16], China [17] and Germany [12]. Scientific disciplines involved in the studies were nursing sciences [10,13,15-16], medical sciences [11-12,14,17], economics [10,12] and social sciences [16]. Four of the studies utilised EHRs to identify adverse events [10-12,14], two to evaluate safety, quality or performance of care [18,17] and two to review care processes [13,16].

The study designs were majorly quantitative, non-randomized studies [10-14,16-17] with one exception of a mixed method study design [15]. Assessments were made analysing standardised data derived from EHRs such as number of patient contacts, used care interventions or physical and mental health measurements [13-16], diagnostic entries or codes [10,12,17] or Read codes [11,14]. Data extraction method was specified in five studies, with three using automated data extraction methods [10-11,14] and two manual methods [15-16].

EHRs were unanimously regarded as an applicable data source, highlighting the importance of the consistency and nature of datasets in assessing service quality. They provided a valuable snapshot into real-world patient care [13,15], and when using standardised diagnostic coding as a quality measure, the results were regarded as highly objective [17]. However, small samples [15] and incomprehensive datasets [10-11,13-14,16] were perceived as a limitation, resulting in imprecise or incomplete quality measurement. Additionally, entries made in the records did not necessarily indicate the quality of care functions, only their existence [16]. Using more complex and diverse quality criteria [11] and having universal definitions [12] could have resulted in a more comprehensive analysis of service quality.

Six studies provided suggestions to help advance the usability and research of EHRs in assessing quality of services. Foremost, to provide best possible information to both researchers and clinicians, systemic changes in use of EHRs are needed in regards to what and how care measures, patient outcomes or adverse events are reported [12-14,16]. Additionally, the association between adverse events identified in the health records and nurse staffing levels, for example, could be further explored, advancing the impact of quality care [10]. Moreover, using data mining techniques with large datasets, and seeking unexplored patterns adjacent to adverse events could be intensified [11].

4. Discussion

The results show that use of EHR data for systematic evaluation of health service quality is still very limited, although it is on the increase. It is important to acknowledge that data documented in EHRs are diverse in quality [18] and this may impact evaluation outcomes. Therefore, it is important to improve documentation practices and evaluate documentation quality on a regular basis when used to evaluate services. EHR-based quality evaluation results may then be added to a broader set of indicators collected from a variety of sources such as patient surveys and different data bases. Potential benefits of EHRs as part of service quality evaluation have been reported previously as well [19].

Secondly, current approaches using EHR data for evaluating service quality focus on structured data alone without other advanced analytical methods, although documented care is largely in narrative format containing rich descriptions of the service users' health related issues, care process and provided care [20]. Therefore, future research should explore possibilities of using natural language processing and text mining of narrative information in EHRs. Combining structured and unstructured data as sources for quality assessment provides a more holistic view of the care documented.

Thirdly, included studies involved only either nursing or medical researchers and no study involved a combination of health experts from different domains, highlighting a clear lack of systems thinking and a need to increase engagement and representation of different health care professionals in the development process of such systems for a balanced and comprehensive approach to sustainable assessment of health service quality.

Finally, the findings indicate that means and definitions on evaluating quality of health services still differ. Previous research has also encountered this issue, as illustrated by a systematic review on health care quality measurement using Service Provision Assessment datasets. A sample of 34 studies indicated that quality constructs were operationalized in extremely different ways, vastly limiting the generalizability of the results. [21] Current systems do not support such tasks sufficiently due to e.g. access, standardisation and interoperability issues [6]. More work is needed to develop a comprehensive and balanced framework of standardised outcome measures to be used in (semi)automated quality assessment tools on different levels in the health system. This would support benchmarking of service quality both within and beyond organisations and countries.

Our study limitations include a limited number of databases searched and a lack of quality assessment of studies included in the review. Future research is needed to explore to what extent EHRs can be used (i.e. content, extent, validity, technical and practical perspectives) to contribute to an overall assessment of health service quality when combined with data from multiple other sources.

5. Conclusions

Use of EHR data in assessment of health service quality is still limited. Currently, structured data are used to assess patient safety, processes and performance -related issues. Development of a comprehensive framework with standardised indicators with an interdisciplinary effort has the potential to support appropriate use of advanced analytical methods for better use of the unexplored potential of EHR data in comprehensive, transferable and automatised evaluation of health service quality.

References

- World Health Organization, Organization for Economic Co-operation and Development, World Bank. Delivering quality health services: a global imperative for universal health coverage. WHO; 2018.
- [2] National Academies of Sciences, Engineering, and Medicine. Crossing the Global Quality Chasm: Improving Health Care Worldwide. Washington (DC): National Academies Press (US); 2018.
- [3] Donabedian A. The quality of care: How can it be assessed? JAMA. 1988;260(12):1743-8.
- [4] World Health Organization. Quality of care: a process for making strategic choices in health systems. WHO; 2006.
- [5] Wang Y, Kung K, Byrd TA. Big data analytics: Understanding its capabilities and potential benefits for healthcare organizations. Technol Forecast Soc Change. 2018 Jan;126:3-13.
- [6] Perloff J, Sobul S. Use of electronic health record systems in accountable care organizations. Am J Manag Care. 2022 Jan;28(1):e31-4.
- [7] Tricco AC, Lillie E, Zarin W, O'Brien KK, Colquhoun H, Levac D, et al. PRISMA extension for scoping reviews (PRISMA-ScR): checklist and explanation. Ann Intern Med. 2018;169(7):467-73.
- [8] Arksey H, O'Malley L. Scoping studies: towards a methodological framework. Int J Soc Res Meth. 2005;8(1):19-32.
- [9] Elo S, Kyngäs H. The qualitative content analysis process. J Adv Nurs. 2007;62(1):107-15.
- [10] Murphy A, Griffiths P, Duffield C, Brady NM, Scott AP, Ball J, et al. Estimating the economic cost of nurse sensitive adverse events amongst patients in medical and surgical settings. J Adv Nurs. 2021 Aug;77(8):3379-88.
- [11] Tsang C, Majeed A, Banarsee R, Gnani S, Aylin P. Recording of adverse events in English general practice: analysis of data from electronic patient records. Inform Prim Care. 2010 Jun;18(2):117-24.
- [12] Friebel R, Henschke C, Maynou L. Comparing the dangers of a stay in English and German hospitals for high-need patients. Health Serv Res. 2021;56(Suppl. 3):1405-17.
- [13] Guest JF, Fuller GW, Edwards J. Cohort study evaluating management of burns in the community in clinical practice in the UK: Costs and outcomes. BMJ Open. 2020 Jan;10(4):e035345.
- [14] Tsang C, Bottle A, Majeed A, Aylin P. Adverse events recorded in English primary care: Observational study using the General Practice Research Database. Br J Gen Pract. 2013 Jan;63(613),e534-42.
- [15] Gardner G, Gardner A, O'Connell J. Using the Donabedian framework to examine the quality and safety of nursing service innovation. J Clin Nurs. 2014 Jan;23(1):145-55.
- [16] Lawn S, Zabeen S, Rowlands N, Picot S. Hidden care: Revelations of a case-note audit of physical health care in a community mental health service. Int J Ment Health Nurs. 2018 Dec;27(6):1742-55.
- [17] Ji X, Fang Y, Liu J. Performance assessment of the inpatient medical services of a clinical subspecialty: A case study with risk adjustment based on diagnosis-related groups in China. Medicine. 2018 Jun;97(24):e10855.
- [18] Akhu-Zaheva L, Al-Maaitah R, Bany Hani S. Quality of nursing documentation: Paper-based health records versus electronic-based health records: J Clin Nurs. 2018 Feb;27(3-4):e578-89.
- [19] Shapiro LM, Kamal RN. Implementation of electronic health records during global outreach: A necessary next step in measuring and improving quality of care. J Hand Surg Am. 2022 Mar;47(3):279-83.
- [20] Jefferies D, Johnson M, Griffiths R. A meta-study of the essentials of quality nursing documentation. Int J Nurs Pract. Apr 2010;16(2):112-24.
- [21] Moucheraud C, McBride K. Variability in Health Care Quality Measurement among Studies Using Service Provision Assessment Data from Low- and Middle-Income Countries: A Systematic Review. Am J Trop Med Hyg. 2020 Sep;103(3),986-92.