

Using Mental Health Indicators to Improve Health Care Management: A Web-based Approach

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Abstract. Mental health indicators are essential for monitoring people's mental health status, developing mental health policies, and evaluating the performance of such policies. The aim of this paper is to describe the development of a web-based tool for mental health indicators capable to support the management of Brazilian mental health care networks. The SISAM is a web information system responsible for management and provision of mental health information in Brazil and it was chosen as the use case of this study. The indicators were developed as a decision support web tool for public health managers. The tool is able to calculate 11 indicators related to inpatient care. A descriptive analysis of all indicators is presented using SISAM data from 2017. The results generated by the tool are promising and could provide improvements on care monitoring, evaluation of possible trends and investments in prevention and promotion in mental health care.

Keywords. Mental health, indicator, health management

1. Introduction

Health indicators are important tools to help management, monitoring and evaluation of the health at all public health levels [1]. Additionally, they can measure and show information about the general level or characteristic of many health topics, such as the health status of a population or population groups, health policy, healthcare system, healthcare resource, natural environment, size and composition of population, and people's perception and value of health [2]. Moreover, the creation of indicators regularly by dynamic information systems is another important tool that can be used by healthcare professionals and stakeholders to improve healthcare [1].

Considering the fact that mental illness is one of the greatest public health issue, the World Health Organization (WHO) elaborated the Mental Health Action Plan for

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2013-2020 [3]. One of the plan aims is the empowerment of information systems and research on mental health care (MHC) by the creation of systems based on indicators use to outline the information needed [3]. Thus, the development and implementation of mental health indicators (MHI) are also essential for monitoring people's mental health (MH) status, developing MH policies, evaluating performance of such policies and comparing and benchmarking performance information among countries [2].

However, the implementation or improvement of specific information systems for MHC containing indicators are very limited [4]. So, one of the few systems for MHC in Brazil is the Information System on MHC (SISAM) [5]. The system is a web-based computerized information system that enables real-time patients and services monitoring in a Mental Health Care Network (MHCN) since 2012 [5]. The region covered by SISAM comprises 26 municipalities, an estimated population of 1,483,715 inhabitants in 2017 and its MHCN includes several types of services in different levels of care [5]. In addition, SISAM manages information about socio-demographic and clinical patient data, outpatient services data and hospital data [5] and, currently, only presents a summary report of the collected data; but it does not generate indicators automatically.

Therefore, the aim of this paper is to describe the development of a web-based tool for MHI capable of support the MHCN management. This study is part of an interpretative study proposing an evaluation model for MHCN focusing on the use of information technologies for its management and applying semi-structured interviews to understand the MHCN management according to its managers and by the definition of an indicator set [6].

2. Methods

The development of the indicators tool was divided into the following steps: (i) definition of the MHI; (ii) definition of the dataset used for the implementation; (iii) implementation of the prototype tool; and (iv) testing and validation of the proposal.

In the first step, we decided to use 11 indicators related to inpatient care in MH that could be calculated from the SISAM dataset that were suggested by a previous study from Delfini [7]. Those indicators were chosen from indicators defined and used in other countries (Canada, Australia and United Kingdom) [7]. Moreover, that study also defined a Minimum Data Set (MDS) for MHC by the comparison with Brazilian and other countries MDS. In addition, it identified that SISAM data contained 87.0% of the suggested MDS [7]. Thus, the previous study also generated conceptual and computational models based on SISAM by using HL7 FHIR and openEHR.

Thus, we decided to use the MHC information of the MHCN comprised by SISAM as the main dataset for the indicators' implementation. In addition, SISAM allows access to integrated data through the eHealth-Interop platform [8]. With this platform, the indicator tool can be adapted to support other systems and other data sets. The platform for health data exchange is implemented based on the Loopback framework [9]. The communication is made through web services, with the support of a terminology server based on the HL7 FHIR standard.

The proposed tool was built to perform the automatic calculation of the selected indicators during a real time query. It will present the available indicators along their definition and it will also provide specific filters enabling the users to achieve greater data disaggregation on temporal, spatial, clinical and socio-demographic aspects. The

chosen filter were time period of interest, patient sex, patient age groups, diagnostics with ICD-10, patient's place(s) of origin, and inpatient service(s). Moreover, each filter is displayed differently according to the indicator chosen because of the measurement differences. Thus, the results from the indicator measurement could be displayed in tables or graphics depending on the user's choice. We used prototyping method in the tool's development. The design of all user interfaces, graphics and tables was made using Bootstrap framework with the template AdminLTE (version 2). For the back-end development, the framework CakePHP was used together with an Apache2 web server, PHP programming language and MySQL database management system.

The tool prototype was tested using use cases to verify its functionalities and its interfaces. All errors and improvements identified at this stage were then addressed and corrected if needed. Finally, we made a descriptive analysis of the indicators reporting the information in the SISAM data from 2017.

3. Results

The indicators selected to be implemented on the proposed tool were: admissions for depression, admissions for MH and behavioral disorders related with alcohol, admissions of children with mental illness, admissions for self-harm, emergency admissions for neurosis, emergency admissions for schizophrenia, admissions for substance abuse, admission for deliberate self-harm in children and youth, hospitalizations for more than 30 days in 1 year, average length of acute inpatient stay, and 28 days readmission rate.

The development process resulted in a preliminary version of the tool. Moreover, the use of the interoperability platform provided a more reliable information, since it was possible to perform data aggregation from information system of MHCN' mental hospitals and national databases to the SISAM data, to identify inconsistencies and to eliminate duplicity. During testing, we identified the need for future incorporation of statistical analyses to the tool results as well as the need to perform usability tests with possible users to verify if the tool meets their expectations and whether there are possible unidentified improvements.

From the descriptive analysis using the MHCN data from 2017, we observed that the admissions rate for depression was 5.32 per 100,000 inhabitants and it was higher for women than men. The indicators for self-harm and deliberate self-harm admissions in children and youth had very low rates regionally, respectively 0.30 and 0.20, because the data only contained information from psychiatric beds. The remaining indicators for admission had higher values for men than women. In addition, the region had a hospitalization rate of more than 30 days equal to 39.49, the 28 days readmission rate equals to 4.63, and the mean length of inpatient stay of 12.16 days. An example of an indicator measurement resulted by the tool can be seen in Figure 1.

The use of the indicators' information resulted from this tool could enable improvements on care monitoring and MHCN organization, evaluation of possible trends, and investments in prevention and promotion. Moreover, this tool would be one of the first to evaluate a MHCN in Brazil, which makes its development extremely important given the shortage or non-existence of such tools in Brazil [4]. At last, the use of this tool will also help to strengthen information dissemination by expanding indicators' knowledge and the use of information systems by professionals and managers, since both are still deficient in MHC.



Figure 1. Example of the graphic result from the developed indicator tool of SISAM.

4. Conclusion

The investment in development and research to assist health professionals and managers in MHC management is very important given the increasing burden of MH issues in the population. Thus, the development of the MHI tool in this study is an initiative to assist this scenario in Brazil. As future work, we will search for more indicators beyond those from inpatient care implemented in this study. Our future goal is to include indicators for other areas of care and the MHCN as a whole by searching indicators used in countries with free public health, incorporating information from more databases and interoperating with other sources.

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