

Real-Time Management Dashboard as a tool for process improvement at the Outpatient level in a region of Brazil

Lívia Loamí Ruyz Jorge de Paula¹, Milena Portella Camargo Labriola², Thiago Ramos Camargo², Daniela Aparecida de Oliveira Massaneiro², Edmundo Carvalho Mauad³, Vânia Soares de Oliveira e Almeida Pinto², Amaury Lelis dal Fabbro⁴, and Isabela Campos Pereira Hernandes⁵

¹Pio XII Foundation

²Ambulatório Médico de Especialidades – Pio XII Foundation

³Hospital de Amor

⁴Universidade de Sao Paulo Faculdade de Medicina de Ribeirao Preto

⁵Faculdade de Ciencias da Saude de Barretos Dr Paulo Prata

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Abstract

Background: Specialized outpatient clinics account for about 30% of the total number of visits in the entire Brazilian health system. The Real-Time Management Dashboard (RTMD) is a tool that has great potential to deal with process errors, improve patient care and reduce costs, but its use is still concentrated in the hospital sector on a small scale. The aim of this study was to study the implementation and results of indicators of waiting for time and achievement of goals with the help of RTMD in a specialized ambulatory care outpatient unit. **Method:** This is a longitudinal study in which the analysis of waiting time indicators for consultations and exams was carried out in September and October, between 2012 and 2021. Information on user satisfaction with the time of service in the studied period was also evaluated. **Results:** A total of 277,925 records from 80,432 patients were analyzed. It could be observed that the monitoring of waiting time indicators through the RTMD contributed to better control of the flow of patients within the ambulatory unit with a decrease in the delay rate after the implementation of the immediate action protocol and waiting time classified as excellent by 97.1% of users with respect to the satisfaction rating. In addition, the RTMD contributed to the achievement of consultation and examination goals over the 10-year period of study. **Conclusion:** The RTMD proved to be a promising tool for the management of processes within medical specialty outpatient clinics. **Keywords:** Clinical Decision Support; Medical Informatics; Primacy Health Care; Public Health

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Corresponding Author Lívia Loamí Ruyz Jorge de Paula Loja Maçonica Renovadora 68 Avenue, 105, Barretos, São Paulo, Brazil. Phone: +55 17 3321 2800 - livialoami@gmail.com
Milena Portella Camargo Labriola Quality Analyst. MBA in Hospital Administration with Emphasis on Auditing. Ambulatório Médico de Especialidades – Pio XII Foundation
Thiago Ramos Camargo Information Technology Department Coordinator - Ambulatório Médico de Especialidades – Pio XII Foundation
Daniela Aparecida de Oliveira Massaneiro Administrative Manager – Ambulatório Médico de Especialidades – Pio XII Foundation
Edmundo Carvalho Mauad Ph.D. Advisory Director – Pio XII Foundation
Vânia Soares de Oliveira e Almeida Pinto Master in Education. Family Physician. Professor at the Faculty of Health Sciences Dr. Paulo Prata. Physician at the Pio XII Foundation. Coordinator of the Matrix Support Program
Amaury Lelis dal

Fabbro Full Professor - Department of Social Medicine - Faculty of Medicine of Ribeirão Preto - University of São Paulo
Isabela Campos Pereira Hernandez Master's Degree Student. Clinical Research Project Assistant - Teaching, Research, and Innovation Institute - Faculty of Health Sciences
 Dr. Paulo Prata *Livia Loami Ruyz Jorge de Paula* Ph.D. Clinical Research Coordinator - Teaching, Research, and Innovation Institute - Ambulatório Médico de Especialidades – Pio XII Foundation

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We know of no conflicts of interest associated with this publication, and there has been no significant financial support for this work that could have influenced its outcome.

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Highlights

- The delay rate of care decreased in all departments in 2020-2021.
- In 70% years studied, consultation goals were achieved.
- 100% of users considered the waiting time to be excellent or good.

Keywords: Clinical Decision Support; Medical Informatics; Primacy Health Care; Public Health; Management Unit

Introduction

Specialized outpatient care units in Brazil account for about one-third of the total consultations and procedures in the entire public health system, covering about 56 million people^{1(p20)}.²

The Specialty Medical Ambulatory (SMA) emerged in 2007 as a measure of the State of São Paulo (SP) government to increase the resolution of primary health care (PHC), with easy, fast, and resolute access to specialized consultations and exams, and surgeries³. The SMA of Barretos (SP), managed by the PIO XII Foundation, was created in 2011 to meet the demands of this regional health sector, made up of 18 municipalities. It has 96 professionals (doctors, nurses, psychologists, physiotherapists, and nutritionists) who provide an average of 10,000 consultations per month.

Among the barriers encountered by users regarding these specialized services is the waiting time for consultations or examinations, even with prior appointments being scheduled. This reality is experienced in other countries such as the United States, Canada, China, and Colombia as well as Brazil⁴⁻⁷. This difficulty is

directly linked to the patient’s dissatisfaction as this time spent interferes with their family routine as well as harms their work. In addition, the delay in appointments is one of the three variables that users consider when classifying and recommending the best health services^{8,9}.

To face this challenge, previous studies investigated the causes and provided some solutions for the long waiting time, such as changing patient call sequencing processes¹⁰, reviewing flows¹¹, and testing new resource and personnel allocations⁸.

The Real-Time Management Systems (RTMS) has been a tool with tremendous potential to resolve process errors, improve patient care, reduce costs, and increase profits, specifically due to the use of the Real-Time Location System (RTLS). Use of this tool has largely been limited to hospital services and on a small scale¹².

Research conducted in maternity hospitals in Ontario, Canada, observed that implementation of the Dashboard was associated with clinically relevant improvements in the unit indicators¹³. Another study carried out at St. Joseph Mercy Oakland General Hospital in the United States demonstrated that the Real-Time Management Dashboard (RTMD) also contributed to efforts to monitor the progress of the hospital’s performance according to quality indicators, in addition to enabling continuous changes in the facility’s strategies to achieve their management-improvement objectives¹⁴.

Considering the high flow of patient care in secondary care, the need to improve the organization of processes, and the scarcity of studies in which the RTMS was employed in outpatient areas, the objective of this study is to report the implementation and results of two indicators administered with the assistance of the RTMD in a specialized-care ambulatory clinic.

Methods

The implementation of the RTMD in the SMA of Barretos (SP) took place in September 2012. After a meeting between managers and health teams, two main indicators were selected to be reported on the dashboard: time at which each stage of user care is completed, with signage in different colors for delayed or nearly delayed cases, and monitoring consultations and exams’ monthly goal (Figure 1).

Real-time monitoring of the monthly goal was chosen to facilitate visualization of production and to enable an action plan for achieving that goal. The indicator “waiting time” was chosen because it is one of the items with many complaints in secondary health care units, representing around six to ten percentage points in satisfaction questionnaires^{4,9,15}.

To evaluate the results of the implementation of the RTMD, information on delay events was used in four sectors (registration, outpatient clinic, endoscopy, and radiology) in the months of September and October from 2012 to 2021. Data on the fulfillment of consultation goals were also collected during this period. One of the institution’s goals is to carry out at least 90% of the consultations contracted by the State government. This information was obtained directly from the SMA’s electronic system. Information on the user satisfaction index in relation to waiting times for consultations and exams was also consulted in this system.

A stage was classified as “delayed” when the waiting time for each sector exceeded the values defined from the consensus between the health and administration teams: Time for Registration (the period between password withdrawal at reception and completion of registration for new patients) was 20 minutes and Total Time (the time between the password being removed at reception and the completion of the last stage of patient care) was 50 minutes for Radiology and Endoscopy, and 60 minutes for the Outpatient Clinic.

For cases in which one of the phases of care is delayed, a flow was also created in June 2021 that focuses on the immediate identification of the problem and its resolution, when possible, as described in Figure 2.

A yellow alert is generated on the dashboard to signal the approach of the maximum time established for the end of the patient’s stage of care. If the delay has occurred already, a red alert is generated. When one of these alerts is issued, the quality department nurse informs the leader of the sector in which the delay occurred, and he takes immediate action to resolve the problem. This occurrence is recorded in a database

(Research Electronic Data Capture - REDCap), and quarterly data analysis is performed, and improvement plans are established together with the team.

Descriptive statistics were used, such as measures of central tendency and dispersion (mean, median, standard deviation (SD), maximum and minimum), and absolute and relative frequencies to describe the rates of delay and meeting goals for consultations, length of stay in the institution, and user satisfaction levels. The Kruskal-Wallis's test was used to compare the length of stay in the unit over time. All data were collected using the REDCap platform and analyses were performed using SPSS v. 25; the results were considered significant when $p < 0.05$.

Results

In September and October 2012 to 2021, the execution times of the stages of care for 80,432 patients were analyzed, totaling 277,925 records. The delay rate per sector and the average time spent by the user inside the unit are shown in Tables 1 and 2, respectively.

The delay rate (%) of care in 2020 and 2021 decreased in the four sectors under analysis, with variation, in the other years. There was a significant difference in the users' length of stay in the unit in all years, and the medians were above the maximum time proposed for the sectors of registration and outpatient clinic.

In the analysis of these events by the quality sector, it was observed that, in the registry sector, the reason for delay in all cases was the time staff waited to receive the referral or examination request from the municipality of origin, when users did not present them to the clinic.

For the outpatient clinic, the main reasons for delay were the presence of medical students accompanying the professional (29.03%); attending to complex cases requiring more office administration (19.35%); and delay in the arrival of the doctor (19.35%). With regard to consultation targets during the period, the institution achieved over 100% in 70% of the months studied (Table 3).

In the evaluation of satisfaction with the waiting time for consultation, 100% of users classified it as excellent or good.

Discussion

Statement of principal findings

In this article, we evaluated the changes that occurred during the management of a medical specialty outpatient clinic after the implementation of a RTMD. The RTMD monitors the length of users stays and delay events at each of the user service stages within the institution.

Our results showed that the RTMD contributed to the achievement of the goals set for medical and non-medical consultations over the years. As it made it possible to observe, in real-time, the number of consultations performed in a month and thereby contributed to the planning of actions to increase demand for this dashboard.

The median length of stay of the users in the radiology and endoscopy department remained within the maximums proposed by the managers and health-care teams in most of the years studied in this article. The dashboard showed the patients' length of stay for care and the doctors' delays, so that the other employees no longer had to ask the receptionists about the users who were late for an appointment.

For registration sector and clinical outpatient consultations, the results were the opposite, with a decrease in the number of delay events in 2020 and 2021 after the implementation of the RTMD's immediate action protocol. With access to RTMD information within a department, an increased commitment by the sector leaders to resolve delay events was observed. With immediate actions taken when a problem was identified, and follow-up discussions and proposals providing plans for improvements.

The main reasons that caused delays in care were related to the presence of intern students during consultations, treatment of more complex cases that required more time for evaluation and problems with power

outages or Internet and medical delays. Research carried out in Australia to investigate the effects of the changes in the hours worked by physicians in a general practice on patients' waiting times within a primary care unit showed that a 10% reduction in the hours worked by the physicians increased the average waiting time for patients by 12%¹⁶. That is, in a period of four hours on duty in an outpatient clinic, if a doctor is 40 minutes late, this will result in a longer waiting time of approximately 50 minutes for his or her patients.

In addition, studies have shown that the student's presence during the consultation does not affect patients' satisfaction with the service, and that consultations during the school period have higher levels of satisfaction compared to those during non-school periods^{17–20}. There is also evidence that the waiting time for care is unevenly distributed among people with lower socioeconomic levels around the world, although this has improved in some countries²¹.

Although these delays occurred in the sectors in question, the satisfaction rate with the waiting time for care reached at least 97.1%, which is considered excellent. In the health region where the study was developed, most municipalities use health services from larger cities, such as the city of Barretos. Patients arrive at and leave the SMA by means of collective transport (bus) offered by the municipalities all at the same time, without personalizing the logistics. This motivated us to find strategies that could improve the reception of these patients through more agile, controlled and humanized care.

This action was also suggested by researchers in a study carried out in China, whose objective was to examine the associations between waiting time before medical care, consultation time and the level of patient satisfaction in the endocrinology outpatient clinic of a university hospital. The authors stated that it is not always possible to reduce the waiting time by increasing resources (such as expanding the healthcare team, for example). However, offering clear and transparent information about the status of care to users and providing care in a humanized way can contribute to increased levels of satisfaction²².

Strengths and limitations

The results presented are subject to bias, as the time after the service was not considered for the satisfaction questionnaire. This was because the data used were compiled without the possibility of accessing the date and time of application of the instruments. In addition, it was not possible to detect which users did not have their passwords downloaded into the system, resulting in a longer period of care even if the patient had already been treated. In an attempt to minimize this type of bias, data with more than 12 hours of waiting were not considered, since the health unit only provides care for a period of 12 hours.

Interpretation within the context of the wider literature This cross-sectional study investigated whether the Real-Time Management Dashboard could be a tool to help improve processes, care and patient satisfaction. Studies^{12–14} have been described using it mainly in hospitals, but still on a small scale. This study brought the applicability of RTMD as a tool for improving processes within the outpatient environment.

Implications for policy, practice and research

The next step in expanding the RTMD in outpatient management will be to apply it to the analysis of other indicators, such as absenteeism and optimization of rooms and equipment. At the Health Network level, the RTMD can also be applied in emergency and primary care units, being necessary here to adapt the indicators to the necessary objectives, but always considering the identification of the problem and immediate action as the main conducts to be carried out. Future research should consider the use of other management indicators to assess RTMD within primary and secondary health care.

Conclusion

As the demand for improvements in health services is continuous, there is a need to incorporate technological tools that can facilitate process management. The RTMD applied within a secondary care unit, may have contributed to the achievement of consultation targets and control of the maximum waiting time. This study showed that some factors can lead to delays in care, but satisfaction levels remain high if users have control over the waiting time at all stages and receive humanized care.

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Contributor ship

All authors participated in the process of the initial drafting of the article, review, presentation of the initial idea and design, collection of the data, analysis, and interpretation of the data, and all of them take responsibility for the accuracy of the material contained in the study.

Ethics and other permissions

The authors obtained authorization from the person responsible for the Specialty Medical Clinic to carry out this study. Due to the use of institutional information that does not involve sensitive human data, submission to the Ethics Committee in Local Research was not necessary. The authors declare that they conducted the study in accordance with the Declaration of Helsinki and Brazilian regulations.

Data availability statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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Table 1 – Delay rate (%) by sector in September and October 2012 to 2021. Barretos, 2021.

	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Registration	26.0	93.3	36.6	7.9	2.0	50.3	72.9	81.9	66.1	53.9
Outpatient Clinic	86.0	85.7	89.4	87.4	75.2	84.5	86.3	83.1	62.8	65.2
Endoscopy	10.9	11.5	7.1	0.0	0.0	7.6	14.0	19.4	17.9	9.7
Radiology	5.1	7.0	7.2	0.0	0.2	32.7	31.7	49.1	41.0	41.0

Table 2 – Length of user stay (minutes) in September and October 2012–2021. Barretos, 2021.

Year	Analyse	Registration	Outpatient Clinic	Endoscopy	Radiology
2012	Mean (SD ⁺)	22.9 (SD 32.4)	112.3 (SD 55.3)	19.7 (SD 21.0)	17.2 (SD 18.2)
	Median	10.6	102.36	9.83	11.18

	Min ⁺⁺ to Max [§]	0.0 to 277.4	4.8 to 415.1	0.5 to 97.8	0.0 to 217.4
2013	Mean (SD)	139.8 (SD 84.0)	100.9 (SD 49.3)	23.6 (SD 17.6)	23.5 (SD 19.1)
	Median	137.0	97.8	19.3	19.8
	Min - Max	4.0 to 309.8	2.4 to 489.2	1.4 to 86.6	0.5 to 239.5
2014	Mean (SD)	31.4 (SD 37.8)	99.7 (SD 43.7)	22.2 (SD 17.7)	21.7 (SD 22.4)
	Median	15.8	97.0	17.5	16.6
	Min - Max	0.1 to 518.0	3.3 to 478.5	0.4 to 107.0	0.1 to 458.0
2015	Mean (SD)	9.8 (SD 13.0)	83.5 (SD 42.3)	6.1 (SD 5.4)	8.5 (SD 7.0)
	Median	7.0	84.3	4.3	7.1
	Min - Max	0.2 to 164.2	1.4 to 576.0	0.2 to 24.8	0.2 to 38.4
2016	Mean (SD)	6.1 (SD 9.1)	83.1 (SD 39.8)	5.0 (SD 4.9)	5.9 (SD 10.4)
	Median	3.9	82.9	4.5	3.6
	Min - Max	0.0 to 200.5	0.2 to 544.6	0.0 to 19.2	0.2 to 199.5
2017	Mean (SD)	37.8 (SD 37.4)	94.9 (SD 42.2)	24.4 (SD 17.4)	44.1 (SD 24.7)
	Median	21.1	92.0	20.6	40.5
	Min - Max	1.5 to 207.4	0.0 to 578.0	0.5 to 207.4	1.3 to 246.7
2018	Mean (SD)	63.5 (SD 44.5)	98.6 (SD 43.7)	32.0 (SD 24.3)	42.1 (SD 23.4)
	Median	69.20	94.15	227.25	39.36
	Min - Max	0.1 to 295.3	0.2 to 570.6	0.4 to 226.6	0.9 to 260.6
2019	Mean (SD)	77.0 (SD 46.4)	95.3 (SD 44.7)	33.2 (SD 25.1)	55.4 (SD 30.3)
	Median	86.5	92.1	26.6	50.4
	Min - Max	0.4 to 300.9	1.1 to 492.6	0.8 to 183.9	1.1 to 259.4
2020	Mean (SD)	61.2 (SD 57.4)	74.1 (SD 39.8)	35.3 (SD 44.3)	55.5 (SD 41.4)
	Median	61.4	73.7	26.8	45.7
	Min - Max	0.4 to 518.9	1.5 to 275.5	0.8 to 490.9	0.6 to 436.2
2021	Mean (SD)	74.7 (SD 46.2)	83.3 (SD 46.4)	26.0 (SD 17.7)	50.6 (SD 30.6)
	Median	84.3	81.0	22.9	44.2
	Min - Max	1.2 to 353.9	0.0 to 585.8	0.8 to 135.3	2.1 to 292.9
P	P	<0.001	<0.001	<0.001	<0.001

⁺SD = Standard Desviation; ⁺⁺Min = minimum value; [§]Max = maximum value

Table 3 – Total consultations and target rate achieved (%) by the Specialty Medical Ambulatory (SMA) in September and October 2012 to 2021. Barretos. 2021.

	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Total	7836	8833	11056	10181	12111	11924	12947	13577	13905	11424
Target met (%)	103.1	113.2	113.3	101.2	96.9	94.6	102.7	107.7	110.4	95.2

FIGURES

Figure 1 –Real-Time Management Dashboard. Barretos, 2021.

Figure 2 – Wait time evaluation flow in the Real-Time Management Dashboard. Barretos, 2021.

