LUMEN ET VIRTUS

Evaluation of software to enhance emergency care in the emergency room

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ABSTRACT

The urgent and emergency services of public and private hospitals are the gateways for those seeking care for different types of health problems. With the increase in demand for this service and the consequent overcrowding of emergency rooms, it is necessary to seek improvements and optimization in the patient triage process. In this sense, the present study will aim to weave practical considerations aimed at improving and streamlining emergency waiting rooms in Brazil. This feat will be accomplished through the introduction of a device capable of gauging the main physiological signs that change under the influence of comorbidities, performing the screening safely, effectively, without variants and quickly, which will avoid queues and assist the doctor in his diagnosis.

Keywords: Risk Classification, Urgency and Emergency, Manchester Protocol, Triage, Emergency Medical Services.

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INTRODUCTION

Emergency rooms represent an important part of the gateway to the health system, as part of the population seeks these units to solve less complex problems, causing overcrowding in these services1. This problem in emergency departments seems to be a genuinely Brazilian dilemma. However, observing data from the literature, they note that this is, in fact, a global problem. It is characterized by the occupation of all existing beds in the emergency room (including the back-up beds), with disorganized expansion of stretchers to the corridors and other inappropriate places such as the sector's reception itself2. As a result, patient safety is impaired, as the actions taken towards the patient, treatment and investigation decisions, and even the behavior of physicians change so that the "queue moves" [3].

The Ministry of Health (MH) of Brazil defines emergency care as a set of elements intended to attend to emergencies, providing care to patients whose health problems require immediate care, operating 24 hours a day and having only observation beds. However, the Brazilian reality is far from the theory, in which the large number of elective patient care causes catastrophic waiting times, in addition to hindering and preventing access to those who are really on the verge of death. However, how to differentiate urgency from emergency? It's not always easy. To this end, it is necessary to use some screening instrument or tool, separating the "wheat from the chaff", the severe from the non-severe – those who are at immediate risk of death from those who have a more benign pathology2.

It is known that the Manchester protocol is used in many countries and that a group of Brazilian experts approved this protocol regarding the feasibility of adapting to the Brazilian reality. In Brazil, the state of Minas Gerais is a pioneer in the use of the Manchester Screening System and has been adopted as a public policy since 2008.[4]

The mechanism of this protocol works on the basis of equity, that is, on the care of individuals according to their needs, prioritizing those who need care most urgently13. Thus seeking to equate social inequality and differences, which exist explicitly in the Brazilian scenario, in the field of health. Its classification follows the following steps: identification of the patient's initial complaint, follow-up of the decision flowchart and, finally, establishment of the waiting time according to severity.[5.6]

However, when put into practice, this method presents flaws because it is a complex activity that depends on many variants and unpredictable external factors, such as the state of the work environment, the quality and availability of tools and utensils, the competence of professionals from all sectors of the unit in question, especially highlighting the nurse's capacity for critical judgment and experience for rapid and appropriate triage to the patient's situation and also even the local culture.[7.8]

As a result of the failures of this adopted system, in most emergency care departments, catastrophic episodes of deaths in waiting lines have been reported, due to overcrowding and lack of relocation of the

queue, causing an absurd waiting time only for patient triage. An illustration of the problem would be the case of a 58-year-old man who died on the waiting list of the Emergency Care Unit (UPA) of Fazendinha, in Curitiba. In the screening, he was classified with the color green, which is associated with less urgent cases. While waiting for care, his condition worsened, and the family members asked the nurses for help. However, he was only treated after suffering a cardiac arrest, in which he died.[9.10]

Thus, measures are necessary to resolve the impasse. the implementation of a device capable of performing screening based on physiological data through heart rate, oxygen saturation, blood pressure, body temperature, blood glucose, electrocardiogram and measurement of cholesterol concentration (HDL and LDL), weight and height, would be able to reduce the waiting time for screening, increase the accuracy and quantity of data provided to the patient, in addition to selecting whether this would be urgent or trivial care, the latter being able to be referred to the health center in the location of his residence. Thus effecting the real function of the emergency room, decongesting it, reducing waiting time, improving the effectiveness of triage, as it drastically reduces variants.

The improvement of the system is of paramount importance because user satisfaction, according to some studies, indicates that satisfied users tend to adhere to the prescribed treatment, to provide important information to professionals and to continue using health services, also mentioning that they tend to obtain a better quality of life. In addition to improving the work environment for the employees of the units, not overloading them and being able to provide adequate service due to the demand and the relocation of waiting time.[12]

OBJECTIVE

GENERAL OBJECTIVE

Evaluate and validate the effectiveness and efficiency of the device for triage and self-service system.

SPECIFIC OBJECTIVE

To improve the efficiency and effectiveness of the triage system of emergency care departments, through the implementation of a device to optimize the selection process and the collection of patient data.

METHOD

Based on the problems already mentioned and their respective consequences for patients and health professionals that were identified in dementia in emergency rooms, a device capable of improving the triage system through physiological condition meters was proposed by students from the National Institute of Telecommunications (INATEL) in addition to being data collected faster and more accurately by non-invasive methods.

The solution consists of an automated sorting system. In essence, it is a totem that has infrared sensors capable of inferring the measurements of heart rate, blood pressure, oxygen saturation, body temperature, glucose, cholesterol and in addition, the device also determines height, weight, with the instruments for measuring them installed in the device itself, and performs a kind of ECG by photoplethysmography. Based on this data, the totem determines the individual's level of emergence, more accurately due to the wide availability of several physiological meters that collect more quickly and easily accessible, following the guidelines of the Manchester Protocol. In addition, it also makes a recommendation for those patients whose care would be in health centers, with regular and continuous medical follow-up, which is outside the specialty and function of emergency rooms and is the main cause of overcrowding of these. In addition, the inferred measurements are stored in a database, which the doctor and other professionals in the unit's area can access through a system application or through the totem itself, thus facilitating the obtaining of the patient's history even before the consultation is carried out or in cases of return. The system is provided with a user-friendly interface, guiding the user in a clear and concise way through voice commands, thus including the visually impaired and illiterate.

For the validation of the project, the construction of the product is aimed at the students of the National Institute of Telecommunications (INATEL). Subsequently, an invitation letter and an Informed Consent Form (ICF) will be sent to professionals in the area, graduated doctors active in the screening process. Thus, the judges who agree to participate in the research will sign the consent form and, together with the device, received a personal data sheet and the script for its evaluation. Thus, with the approval of the judges, the device would be validated by professionals from the two areas involved, ready for its implementation in the emergency services of the Samuel Libânio Clinical Hospital and throughout the country.

I. Type of study

Individual longitudinal intervention study (clinical trial study).

II. Study location and period

This study was evaluated through a flowchart sent to the judges through digital platforms and aims to test the prototype at the Samuel Libânio Clinical Hospital.

III. Casuistry

To compose the sample, 25 physicians working in emergency centers and professionals working in the area of control and automation (who acted as judges) were invited to participate. The literature suggests the need for 6 to 20 judges *(HAYNES et al., 1995; ALEXANDRE e COLUCI, 2011).*

IV. Inclusion criteria

Doctors who have already worked in the health area in emergency rooms.

Graduated professionals.

V. Non-inclusion criteria

Professionals who did not agree to participate in the research.

VI. Exclusion criteria

Professionals who did not return the questionnaire within the established deadline or within the limits of the deadline extensions.

VII. Test

For the evaluation of the device, depending on its applicability and effectiveness in first aid centers, a flowchart and a video produced by the undergraduates of the National Telecommunications Institution (INATEL) will be sent to the judges, the evaluation will be through an online form, depending on the current situation of the COVID-19 pandemic.

RESULTS

After reviewing the literature, it was observed that the screening systems in Brazilian public health remain outdated and thus saturated, impairing the final care of access to health. However, there was a need to introduce faster ways to selectivity the condition of these patients, in a faster and more resolute way. After the development of the software by Inatel students, a validation process took place. Participants in the research were physicians who had already been in contact with emergency care, including specialists from various areas, such as anesthesiologists, internal medicine, general surgery, gynecologist, infectious disease specialist, family medicine, otorhinolaryngologist, pediatric surgery, neurology.

The questionnaire consisted of two stages: the first one refers to the identification of the evaluators (ICF, name, year of graduation, specialty). In the second stage, the evaluators answered six questions, four of which marked alternatives, with classification of totally adequate, adequate, partially adequate inadequate, and two essay questions. When asked about the sequence of information, 64% considered it totally adequate, 32% adequate and 4% partially adequate. Regarding the ease of understanding, 52% thought it was totally adequate, 40% found it adequate and 8% partially adequate. As for language, 64% reported being totally adequate, 32% adequate and 4% partially adequate. As for the relevance of the content, 80% found it totally adequate and 20% adequate.

The overall alpha coefficient of the questionnaire analyzed was 0.8772, which was considered almost perfect (APPENDIX 8). When the questions were evaluated individually, Cronbach's alpha was 0.8266; 0,8182; 0,7981; 09033 for questions A, B, C, and D respectively.

The final product of this work was the evaluation of the device, describing and guiding the professional to carry out a triage process through the software analyzing the general condition of the patients, placing them in order of priority and emergency, in addition to collecting several vital data that per hour, in most emergency care are unable to these measurements. Later, it will enable the implantation of the device in reference hospitals and add more vital markers.

DISCUSSION

Information Technology associated with education and health provides advantages in the diagnostic process. Mobile devices enable time- and place-independent use. It also presents other focuses, such as intervention procedures and currently materials prepared for prevention.

The screening available today, in relation to the one proposed by the research, is expensive, as it requires a health professional and requires a greater expenditure of time, thus causing the patient to be subjected to long hours of waiting just to be triaged. In this way, harming the doctor-patient relationship, consequently reducing the chances of treatment adherence. The following studies by Guilherme dos Santos Laureano, Alice Oliveira and Jamylle Neves Barbosa Moura, confirm the premise of the failure of the current model.

In this way, the automation of the triage system of the emergency care departments will help the health professional, obtaining more clinical data about vital data, in less time, with greater precision, and less patient wear. Therefore, the works of Rodrigo Lima Dutra regarding "Proposition of improvements in an emergency care unit through the use of process management tools"; Antonio dos S. Junior with "Intelligent Triage: The Use of the Internet of Things in the Classification of Risks in Emergencies" and Kaio Jia Bin "Evaluation of the impact of the use of artificial intelligence on waiting time for medical care and patient satisfaction in an emergency care service for Covid-19" corroborate the proposal of the present study.

For the implementation of the device, initially a literature review on the subject was carried out in the present study, and numerous failures in the current system in national public hospitals were observed. In this way, validating the need and relevance of the project. Following the validation, judges who had a degree in medicine and who had worked at some point in emergency rooms were selected.

To evaluate the internal consistency and estimate the reliability of questionnaires applied in research, it was presented by Lee J. Cronbach; Lee's Cronbach's Alpha Coefficient (α). This measures the correlation between questionnaire answers, through the analysis of the answers given by the respondents, presenting an average correlation between the questions. The α coefficient is calculated from the variance of the individual items and the variance of the sum of the items of each evaluator of all items of a questionnaire that use the same measurement scale.

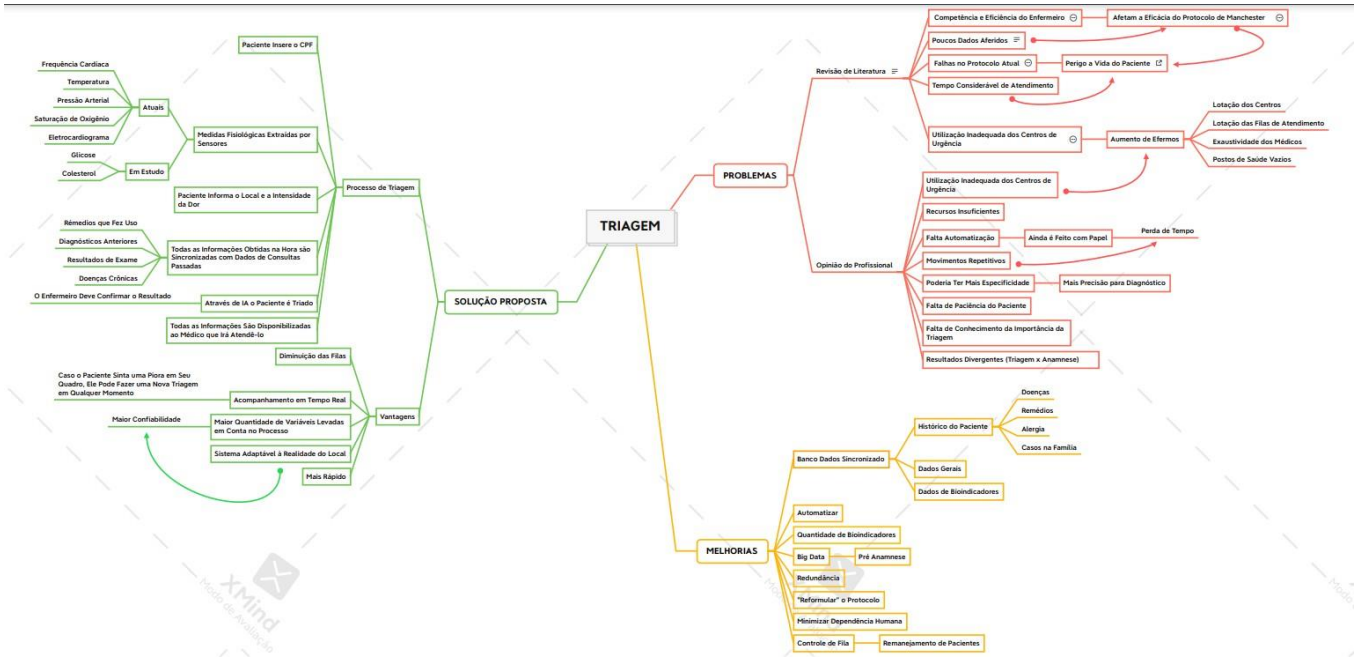
The values of Cronbach's alpha coefficient vary between zero and 1, and the minimum acceptable value is 0.70, because lower than this value, the internal consistency is considered low and at most 0.90, because higher values can be indicative of redundancy or duplication. In the present study, the value of Cronbach's alpha coefficient was 0.8772; indicating almost perfect internal consistency, within the established limits. (ANNEX 6)

Other factors that influence the alpha value are very long questionnaires, which increase the alpha value, without this meaning an increase in internal consistency, and a low alpha value may mean only a small number of questions. There is also redundancy, that is, questions verbalized differently, but practically the same, increase the alpha value. And finally, correlations between quiz items increase the alpha value: if multiple quiz items exhibit correlations with each other, the alpha value increases. As these correlations are greater when the items of the questionnaire measure the same construct, the researcher concludes that the questionnaire has internal consistency, that is, the high value of Cronbach's alpha coefficient would be indicating the degree to which the items measure the same construct. But be careful, there may be a third variable affecting the responses to two items.

With the data tabulated in Microsoft Excel 365 and submitted to statistical analysis, the quantitative variables will be classified through measures of central tendency and for categorical variables, absolute and relative frequency. Data analysis was performed using Minitab version 19.1 and Statistical Package for the Social Sciences, inc. (SPSS) Chicago, USA, version 26.0. The level of significance used as a criterion for acceptance or rejection in the statistical tests is 5% ($p < 0.05$).

ANNEXES

Annex I - Flowchart for the analysis of judges



Annex II

MODELO DE TERMO DE ANUÊNCIA INSTITUCIONAL
(Autorização para coleta de dados)

Santa Rita do Sapucaí, 14 de Setembro de 2020
Carlos Nazareth Motta Marins

Prezado Senhor Carlos

Eu, Ana Carolina De Souza Dias, José Dias da Silva Neto e Flávio Fraga Vilela, da Universidade Do Vale Do Sapucaí do curso medicina, viemos por meio desta solicitar autorização para realizar a coleta de dados nesta instituição em vista da realização da pesquisa da FETIN intitulada Medi – Sistema de Triagem, de caráter aplicado e quantitativo, orientada pelo professor Carlos Alberto Ynoguti com o objetivo de aprimorar o sistema de triagem de hospitais, desenvolvida pelos alunos: Guilherme Ferreira Nogueira Paiva (725 – GEA), Leonardo de Moura Brandão (1473 – GEC) e Vinícius Azevedo Monteiro (706 – GEA).

O projeto de pesquisa será cadastrado na Plataforma Brasil que o encaminhará ao Comitê de Ética em Pesquisa (CEP), para apreciação do estudo.

Agradecemos a atenção dispensada

Atenciosamente

Ana Carolina de S. Dias

Nome e assinatura do pesquisador(es)

Estou ciente da pesquisa e autorizo:

(Assinatura e carimbo)
Diretor

Data: 15/09/2020.

Annex III

Estatísticas Descritivas: Especialidade

Estatísticas

Variável	Especialidade	Contagem Total	Percentual
Especialidade	1	4	16
	2	3	12
	3	1	4
	4	2	8
	5	2	8
	6	3	12
	7	3	12
	8	2	8
	9	2	8
	10	1	4
	11	1	4
	12	1	4

Annex IV

WORKSHEET 1

Estatísticas Descritivas: TF

Estatísticas

Variável	TF	Contagem Total	Percentual
TF	1	11	44
	2	2	8
	3	1	4
	4	11	44

Annex V

WORKSHEET 1

Análise de Itens de Q1; Q2; Q3; Q4

Matriz de Correlação

	Q1	Q2	Q3
Q2	0,710		
Q3	0,750	0,821	
Q4	0,530	0,502	0,530

Conteúdo da Célula
Correlação de Pearson

Annex VI

Estatísticas de Itens e Gerais

Variável	Contagem Total	Média	DesvPad
Q1	25	3,600	0,577
Q2	25	3,440	0,651
Q3	25	3,600	0,577
Q4	25	3,800	0,408
Total	25	14,440	1,917

Alfa de Cronbach

Alfa
0,8772

Annex VII

Estatísticas de item omitido

Variável Omitida	Média Total Ajust.	DesvPad Total Ajust.	Item - Corr Total Aj.	Múltiplas Corr. Quadradas	Alfa de Cronbach
Q1	10,840	1,434	0,7750	0,6080	0,8266
Q2	11,000	1,354	0,8040	0,6962	0,8182
Q3	10,840	1,405	0,8425	0,7353	0,7981
Q4	10,640	1,655	0,5673	0,3262	0,9033

Annex VIII

Tabela 3. Consistência interna do questionário segundo o valor de alfa

Valor de alfa	Consistência interna
Maior do que 0,80	Quase perfeito
De 0,80 a 0,61	Substancial
De 0,60 a 0,41	Moderado
De 0,40 a 0,21	Razoável
Menor do que 0,21	Pequeno

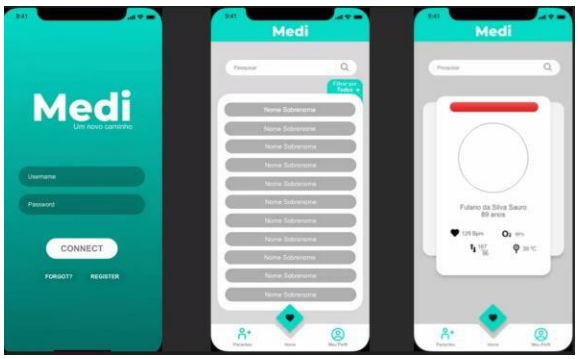
Fonte: Landis, J.R., Koch, G.G. (1977). The measurement of observer agreement for categorical data. Biometrics. 33:159.

Tabela 4. Consistência interna do questionário segundo o valor de alfa

Valor de alfa	Consistência interna
0,91 ou mais	Excelente
0,90 ⊣ 0,81	Bom
0,81 ⊣ 0,71	Aceitável
0,71 ⊣ 0,61	Questionável
0,61 ⊣ 0,51	Pobre
Menor do que 0,51	Inaceitável

Fonte: George, D & Mallery, P. SPSS for Windows step by step: A simple guide and reference. 4th ed. Boston: Allyn & Bacon. (2003). Apud: Gliem, JA e Gliem, RR Calculating, interpreting and reporting Cronbach's alpha reliability coefficient for Likert-type scales. https://scholarworks.iupui.edu/bitstream/handle/.

Annex IX



REFERENCES

1. Silva, M. de F. N. (2014). Protocolo de avaliação e classificação de risco de pacientes em unidade de emergência. *Protocolo de Avaliação e Classificação de Risco de Pacientes em Unidade de Emergência*, 218-225.

2. Durães, A. R. (2018). O curioso problema da superlotação nos serviços de emergências do Brasil. *O Curioso Problema da Superlotação nos Serviços de Emergências do Brasil*.

3. Zambon, L. S. (2011). Longos tempos de espera no pronto-socorro geram maior mortalidade. *Emergências*.

4. Silva, P. L., Paiva, L., Faria, V. B., Ohl, R. I. B., & Chavaglia, S. R. R. (2016). Triage in an adult emergency service: patient satisfaction. *Revista da Escola de Enfermagem da USP, 50*(3), 427-433. http://dx.doi.org/10.1590/s0080-623420160000400008.

5. Inoue, K. C., Murassaki, A. C. Y., Bellucci Júnior, J. A., Rossi, R. M., Martinez, Y. D. É., & Matsuda, L. M. (2015). Acolhimento com Classificação de Risco: avaliação da estrutura, processo e resultado. *REME Rev Min Enferm, 19*(1), 13-20.

6. Paiva, M. B. P., Mendes, W., Brandão, A. L., & Campos, C. E. A. (2015). Uma contribuição para a avaliação da Atenção Primária à Saúde pela perspectiva do usuário. *Physis: Revista de Saúde Coletiva, 25*(3), 925-950. http://dx.doi.org/10.1590/s0103-73312015000300013.

7. Servin, S. C. N. (2020). *Protocolo de Acolhimento com Classificação de Risco*.

8. Costa, M. A. R. (2015). Acolhimento com Classificação de Risco: Avaliação de Serviços Hospitalares de Emergência. *Avaliar o Acolhimento com Classificação de Risco (ACCR) implantado em dois serviços hospitalares de emergência*.

9. Acosta, A. M., Duro, C. L. M., & Lima, M. A. D. S. (2012). Atividades do enfermeiro nos sistemas de triagem/classificação de risco nos serviços de urgência: revisão integrativa. *Revista Gaúcha de Enfermagem, 33*(4), 181-190. http://dx.doi.org/10.1590/s1983-14472012000400023.

10. Klein, A. (2017). *RPC Curitiba*.

11. Ocké-Reis, C. O. (2012). *SUS: o desafio de ser único*.

12. Lima, C. de A. (2015). Qualidade dos prontos-socorros e prontos-atendimentos: a satisfação dos usuários. *Gestão e Economia em Saúde*.

13. Bin, K. J. (2022). Avaliação do Impacto do Uso da Inteligência Artificial no Tempo de Espera Para Atendimento Médico e na Satisfação do Paciente Num Serviço de Pronto Atendimento Para Covid-19. Universidade de São Paulo, Agência USP de Gestão da Informação Acadêmica (AGUIA). http://dx.doi.org/10.11606/d.5.2022.tde-28042022-111211.

14. Junior, A. C. C. dos S. (2020). Triagem Inteligente: O Uso da Internet das Coisas na Classificação dos Riscos nas Emergências. *Seminário Tecnologias Aplicadas a Educação e Saúde Atual*, 143-150.

15. Dutra, R. L. (2021). Proposição de melhorias em uma unidade de pronto atendimento por meio da utilização de ferramentas da gestão da qualidade (Trabalho de Conclusão de Curso, Graduação em Engenharia de Produção). Universidade Federal de Uberlândia.

16. Moura, J. N. B. (2019). Avaliação do enfermeiro frente à utilização da Classificação de Manchester no serviço: Classificação de Manchester no serviço. *Congresso Interdisciplinar - Cerrado, Sua Riqueza e Diversidade*, 2595-7732.

17. Oliveira, A. (2022). As dificuldades enfrentadas pelo enfermeiro na aplicabilidade do protocolo de Manchester nos serviços de emergência. *Repositório Universitário da Ânima*.

18. Laureano, G. dos S. (2021). Monitoramento da execução do Protocolo de Manchester: uma proposta tecnológica para o hospital universitário de Florianópolis. *Repositório UFSC*.