

ARTIGO ORIGINAL



WhatsApp™ as a Tool in Teaching Elementary Electrocardiogram in Medical Graduation

WhatsApp™ como Ferramenta de Ensino do Eletrocardiograma Básico na Graduação Médica

Gilson Soares Feitosa-Filho^{1,2}, Raiza M.A.C. Martins², Monique C.B. Matos², Yuri F. de C.E. Santo², Rodrigo M. Amaral², Thiago C. Pereira², Flávia G. Pereira², Gilson S. Feitosa^{1,2}

¹Serviço de Cardiologia do Hospital Santa Izabel; ²Escola Bahiana de Medicina e Saúde Pública; Salvador, Bahia, Brazil

Objective: To observe whether the use of WhatsApp™ can contribute to the improvement and retention of ECG knowledge during medical graduation in a period-time of 4 months. **Material and Methods:** A controlled, quasi-randomized, intention-to-treat, clinical trial. Medical students of the 2nd and 3rd semester attended a 2-hour class on elementary ECG interpretation. A test with 10 ECG tracings covering subjects was applied with a possible 0-10 score at 4 different times: immediately before the lesson (M1), immediately after the lesson (M2), one month after the lesson (M3) and four months after the lesson (M4). Intervention group, formed by 2nd-semester students, were included, shortly after M2, in a WhatsApp™ group, in which final year medical students and a cardiology resident discussed ECG tracings frequently in the absence of a teacher. Control group, formed by 3rd-semester students, was instructed to study on their own. **Results:** 13 students were included from the 2nd semester and 11 from the 3rd semester. In M1, the intervention and control group obtained a median of 0.0. In M2, both groups presented a similar increase with a median of 4.0 (IIQ=2.8-5.0) for the intervention group and 4.5 (IIQ=3.3-5.5) for the control group. In M3, there was a difference between group scores, with a median of 6.0 (IIQ=3.5-7.0) for the intervention group and 2.0 (IIQ=0-4.0) for the control group (p=0.016). In M4, difference was maintained (4.0 for intervention group [IIQ=3.0-6.3] vs. 1.0 [IIQ=1.0-3.0] for control group [p=0.006]). **Conclusion:** Early-stage medical students learned and retained more elementary ECG knowledge when participating in WhatsApp™ ECG group discussion with more advanced medical students and medical resident, even without a teacher in this group.

Keywords: WhatsApp™; Tool; Teaching; ECG.

Objetivo: Observar se o uso do WhatsApp™ pode contribuir para a melhoria e retenção do conhecimento do ECG durante a graduação médica em um período de 4 meses. **Material e Métodos:** Ensaio clínico controlado, quase aleatório, com intenção de tratar. Estudantes de Medicina do 2º e 3º semestres participaram de uma aula de 2 horas sobre interpretação básica de ECG. Um teste com 10 traçados de ECG cobrindo sujeitos foi aplicado com uma pontuação de 0-10 em 4 momentos diferentes: imediatamente antes da aula (M1), imediatamente após a aula (M2), um mês após a aula (M3) e quatro meses após a aula (M4). O grupo intervenção, formado por estudantes do 2º semestre, foi incluído, logo após M2, em um grupo do WhatsApp™, no qual estudantes de Medicina do último ano e um cardiologista discutiam traçados de ECG frequentemente na ausência de um professor. O grupo controle, formado por

Correspondence addresses:

Gilson Soares Feitosa-Filho, MD, PhD
gilsonfeitosafilho@yahoo.com.br

Received: April 16, 2019

Revised: May 31, 2019

Accepted: June 10, 2019

Published: June 28, 2019

Data Availability Statement:

All relevant data are within the paper and its Supporting Information files.

Funding: This work was the result of authors' initiative. There was no support of research or publication funds.

Competing interests: The authors have declared that no competing interests exist.

Copyright

© 2019 by Santa Casa de Misericórdia da Bahia. All rights reserved.
ISSN: 2526-5563

alunos do terceiro semestre, foi instruído a estudar por conta própria. **Resultados:** Foram incluídos 13 alunos do 2º semestre e 11 do 3º semestre. No M1, o grupo intervenção e controle obteve mediana de 0,0. No M2, os dois grupos apresentaram aumento semelhante: mediana de 4,0 (IIQ = 2,8-5,0) para o grupo intervenção e 4,5 (IIQ = 3,3-5,5) para o grupo controle. No M3, houve diferença entre os escores dos grupos, com mediana de 6,0 (IIQ = 3,5-7,0) para o grupo intervenção e 2,0 (IIQ = 0-4,0) para o grupo controle ($p=0,016$). Em M4, a diferença foi mantida (4,0 para o grupo intervenção [IIQ = 3,0-6,3] vs. 1,0 [IIQ = 1,0-3,0] para o grupo controle [$p = 0,006$]). **Conclusão:** Os estudantes de Medicina em estágio inicial aprenderam e retiveram mais conhecimentos básicos de ECG quando participaram da discussão em grupo do WhatsApp™ ECG com estudantes de Medicina e residentes médicos mais avançados, mesmo sem um professor presente nesse grupo.

Palavras-chave: WhatsApp™; Ferramenta; Ensino; ECG.

Introduction

The relationship between learning and search for knowledge has changed drastically since the emergence of a new generation of individuals, generation Y. This generation is formed by those named as “digital natives” born from the 1990s when digital information and communication technologies began to participate in society with significant intensity.¹

These new individuals are technologically immersed from childhood and have never experienced a world without technology, so for them, it is natural to demonstrate skills with these tools, unlike the past generation. Also, generation Y is used to solve problems and seek information that is not found on the web, demonstrating much proactivity when the subject is of their interest. The suitability of generation Y for technology has been used in a way directed by several educational institutions at all levels of education, including graduation.²

Medical education based on the web has shown usefulness in several fields of medical graduation. This method includes mobile learning, which involves the use of mobile technologies, alone or in combination with other media, thus enabling learning in various circumstances.³

In medical education, a subject that stands out is the study of the electrocardiogram (ECG) given its importance in different specialties and its role in the emergency department, and furthermore, its teaching effectively demands time and training.³ Because of the need for the interpretation of these exams by undergraduates in medicine, studies are needed on pedagogical strategies on the subject,

such as the use of online groups in interpersonal communication applications, made very present in the medical community.³⁻⁵ Among the available features, we can highlight WhatsApp™, which functions like an instant messaging platform, exclusively for smartphones.^{5,6}

Thus, the present study aims to observe whether, among students in the initial phase of the medical course, the use of WhatsApp™ discussions, contributes to the improvement and retention of ECG knowledge in 4 months.

The respective study was submitted and approved by the Ethics and Research Committee on Human Subjects (CEP) of Escola Bahiana de Medicina e Saúde Pública under the number of CAAE 39096514.0.0000.5544.

Material and Methods

This clinical trial was a controlled, quasi-randomized, and intention-to-treat study.

Medical students of the 2nd and 3rd-semesters, volunteers, attended a 2-hour class on fundamentals ECG interpretation given by a cardiologist. The calculation of sample size showed that it would take 12 individuals in each group, for a difference of 1.0 point in the score between the two groups, with a standard deviation estimated at 1.0, with a power of 80% and level of significance of 5%.

An open test with 10 tracings covering elementary ECG subjects (heart rate calculation, identification of sinus rhythm, atrial flutter and atrial fibrillation, atrial and ventricular overloads, atrioventricular block, QRS axis calculation, pathological Q wave, infra and ST-segment

elevation, T-wave alterations), with a possible score of 0.0 to 10.0, was applied to the same students in 4 different moments: immediately before class (M1), immediately after class (M2), one month after class (M3) and four months after class (M4). The 2nd-semester students composed the intervention group. They were included in a WhatsApp™ group right after M2, in which a research team composed by three final year medical students and one cardiology resident took turns to discuss ECG tracings through this application daily until M3 and three times a week between M3 and M4.

It is worth noting that the research team did not participate in the correction of the tests. Control group, composed by the 3rd-semester students was directed to keep studying the subject on his own.

Correction of the tests was done by the unique cardiologist, blind to which group each student belonged and without participating in the WhatsApp™ group.

Acknowledging that the degree of participation of the students in the intervention group could impact on the performance of the tests, the four researchers participating in the WhatsApp™ group, blinded to the scores obtained in the tests, elected, in consensus, the six students most involved in the discussions. Thus, the intervention group was divided into two groups: 1-more and 2-less participative students, and each of them was compared with the control group. It is noteworthy that the students were not aware of the evaluation of their degree of participation.

The results of the applied tests were made available individually to each student only at the end of the study.

Inclusion Criteria

- To be an academic of the second or third semester of the medicine course of the Escola Bahiana de Medicina e Saúde Pública (EBMSP) in 2015.
- Having agreement of the participant in the research by signing the Informed Consent Term.

Exclusion Criteria

- Academics without access to the WhatsApp™ smartphone application.
- Students who obtained more than 50% accuracy in the first test applied.

Ethical Issues

The research was submitted to the Escola Bahiana de Medicina e Saúde Pública Ethics and Research Committee on Human Subjects (CEP) and, after signing the Informed Consent Term (TCLE), for which it was informed of the usefulness and the development of the research, the interviewee gave consent for their participation. Also, he was informed as to the optional nature of the participation and the possibility of withdrawing his consent at any time. The privacy of individuals regarding the confidentiality of collected data was ensured within the pre-defined ethical standards of the Helsinki Declaration and Resolution CNS 466/2012.

The researchers pledged to start the study after approval by the Ethics and Research Committee of Escola Bahiana de Medicina e Saúde Pública under the number of CAAE 39096514.0.0000.5544.

Statistical Analysis

For the descriptive analysis, the categorical variables were represented by absolute and relative frequencies, while continuous variables were described through the median and interquartile range (IIQ). The Mann-Whitney test was used to compare the scores of the groups. All tests were two-tailed and were considered statistically significant results with values of $p < 0.05$. Data were analyzed using the Statistical Package for Social Sciences software (version 20.0, SPSS, Chicago, IL, USA).

Results

Twenty-four students were included, 13 of the 2nd semester, allocated to the WhatsApp™ intervention group, and 11 from the 3rd semester, allocated to the control group (Table 1).

Table 1. Sample descriptive characteristics.

Characteristics (N = 24)	Frequency
Population	
Intervention Whatsapp™	13 (54.2)
Control	11 (45.8)

Note: Data was represented as n (%).

At the first moment (M1), the WhatsApp™ intervention group obtained a median of 0.0 (IIQ=0-0), as well as the control group (median=0.0; IIQ = 0-1). At the next moment (M2), the components of both groups obtained a similar increase in their scores with a median of 4.0 for the intervention group (IIQ = 2.8-5.0) and 4.5 for the control group (IIQ = 3.5-5.5). In the third and fourth moments there was a statistically significant difference between the scores of the groups, with a median of 6.0 (IIQ = 3.5-7.0) for the intervention group and a median of 2.0 (IIQ= 0-4,0) for the control group, in M3 (p = 0.016), and medians equal to 4.0 (IIQ = 3-6.3) for the intervention group and 1.0 (IIQ = 1.0-3.0) for the control group, in M4 (p = 0.006) (Figure 1).

Our second analysis compared the control group with two subgroups of the WhatsApp™ intervention group allocated according to their participation in the discussions. Thus, it was observed that the group with the highest participation, when compared to the control group, presented an even greater difference in the scores of the tests, with a median of 6.5 (IIQ=5.8-7.5) in M3 (p=0.005) and equal to 6.3 (IIQ=3.8-8.9) in M4 (p=0.004) (Figure 2). However, the scores of the lowest participation group were not different from the control group scores (median=4.0, [IIQ]=1.0-6.0, p = 0.200, median = 3.5, [IIQ]= 2,0-4.0, p=0.081 in M3 and M4, respectively) (Figure 2). These results suggest that only being part of the intervention group (participating in the WhatsApp™ ECG discussion group) does not increase ECG learning, and stresses the value of an actual training process with the WhatsApp™ discussion (Figure 3).

Figure 1. Distribution diagram of test scores classified by intervention and control.

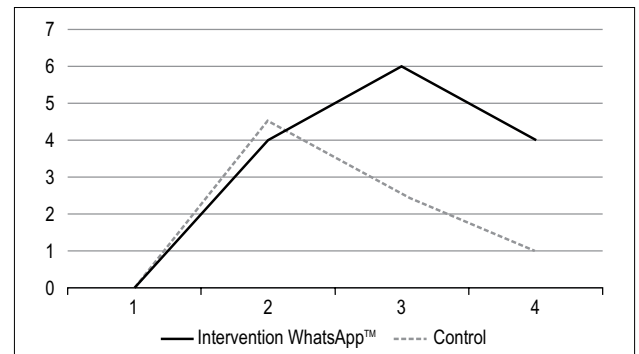


Figure 2. Distribution diagram of test scores classified by intervention and control considering only the subgroup of greatest participation on Whatsapp™ group.

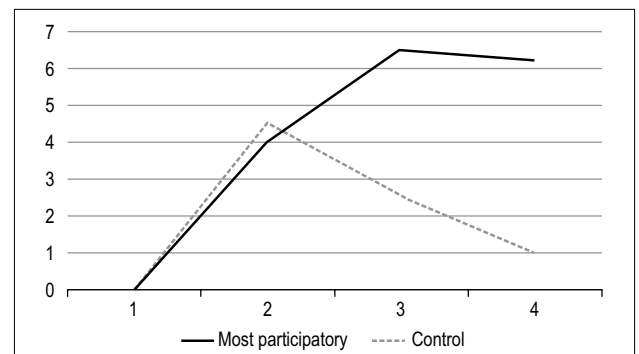
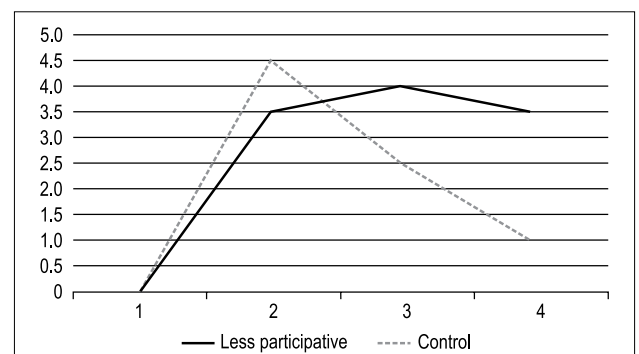


Figure 3. Diagram of the distribution of test scores classified by intervention and control considering only the subgroup of lower participation on Whatsapp™ group.



Discussion

Because of our findings, it is observed in M1 that both groups had low scores since the students of the second and third semesters of the medical school do not have the first contact with electrocardiographic tracings. Thus, the lecture was given later served as a way of equalizing the knowledge of both groups, ruling out any advantage of one over the other by the existence of previous knowledge.

In M2, immediately after the ECG class, there was an increment of the notes without significant difference between the groups, which shows immediate retention of the contents and, once again, without the influence of previous knowledge.

In M3, a month after class, there was a drop in the growth of the control group, while in the group that was exposed to training by WhatsApp™, there was an improvement in knowledge. At M4, at the end of the fourth month of the study, the superiority of the WhatsApp™ intervention group was observed after the established follow-up time. Thus, it is noted that the mean values for those who maintained the training using the WhatsApp™ tool were higher, which ratifies the idea that the sedimentation of knowledge requires training, and that the use of the WhatsApp™ application contributes significantly to this construction. It is also interesting to note that in the medical school in question, a formal ECG course is provided in a 4-month, during the seventh semester. The use of WhatsApp™ can support the maintenance of learning continuously, perhaps even more quickly if synchronized with the subjects of the semester itself. The use of this application and other forms of web learning has already been evaluated positively by other authors, corroborating our results.⁷

In addition to the increase in learning, web-based education seems to be considered more useful by the students and allows greater satisfaction on the part of them. A study carried out in France comparing ECG learning between

two groups of fifth-year medical students: one of them used e-learning via the Modular Object-Oriented Dynamic Learning Environment (Moodle) while the other group attended in-person classes. After two months, the ECG knowledge of both groups increased significantly, with no difference between the groups, however, when the satisfaction question was evaluated through a specific questionnaire, the students in the e-learning group demonstrated, in a significant way, higher interest and ease with the subject. Thus, it is believed that web-based learning promotes more significant critical thinking and decision-making skills in medical students, which increases their autonomy and confidence.⁸⁻¹¹

The intervention group was divided by the level of interest to assess the importance of active participation in the WhatsApp™ group and whether it would improve learning. The results showed that the group of greater interest obtained even greater results compared to the control group, whereas the group of lower interest did not show this difference, despite participation in the intervention group. Thus, we can infer that just being exposed to discussions is not enough of an “advantage factor,” however, maintaining interest in WhatsApp™ group discussions and participating actively, it is. As the application of theoretic evaluation was the method adopted for the consolidation of the research in question, the results were vulnerable to the moment in which the evaluations were answered, since the humor and the degree of anxiety, for example, can influence in the reasoning capacity of the individual.

Finally, the use of WhatsApp™ pedagogical strategies seems to increase the ECG study and provide learning regardless of the geographic location of the students, not present, which provides autonomy for the medical student and helps in the retention of their knowledge. It is essential to emphasize the importance of the participation of teachers and of the medical school itself to increase new teaching strategies that use different technologies and consolidate them in medical teaching.⁷

This study presents limitations. The first one concerns the sample size, which had a total number of 24 participants as initially predicted, but divided into 13 and 11 participants. This study was not a randomized trial. This decision was adopted to ensure that people from the same semester participated in the same research group, thus avoiding that communication between colleagues from the same class, but from different groups, could contaminate the results. In practice, neither of the two semesters has ECG knowledge because they are too early in the graduation course.

Nevertheless, since the most advanced semester was in the control group, the difference reached, if one of the groups had to favor higher graduation, would favor the control group - which did not occur. The students' participation was spontaneous, by invitation, which allows us to imagine that it is a more interested group than the average. However, this does not impact the difference found because the invitation mechanism was similar for both groups.

Conclusion

In conclusion, early-stage medical students learned and retained more elementary ECG knowledge in 4 months when trained through WhatsApp™, even without the presence of teachers in this group.

New studies reproducing the WhatsApp™ application as a teaching tool are necessary for its applicability in this and other areas of activity since such a technological instrument has been widely disseminated.

References

1. Xavier CA. Letramento digital: impactos das tecnologias na aprendizagem da Geração Y. *Caleidoscópio* 2011;9(1):3-14. Disponível em: <http://www.unisinos.br/revistas/index.php/calidoscopio/article/download/748/149>.
2. Giraffa LMM. Jornada nas Escol@as: A nova geração de professores e alunos. *Rev. Tecnologias, Sociedade e Conhecimento* 2013;1(1). Disponível em: <http://www.nied.unicamp.br/ojs/index.php/tsc/article/view/112/100>.
3. Zafar S, Safdar S, Zafar AN. Evaluation of use of e-Learning in undergraduate radiology education: A review. *European Journal of Radiology ANO*;83(12):22-87.
4. Auseon AJ, et al. Methods of teaching and evaluating electrocardiogram interpretation skills among cardiology fellowship programs in the United States. *J Electrocardiol.* 2009;42(4):339-44.
5. Little B, Mainie I, Ho K.J, Scott L. Electrocardiogram and rhythm strip interpretation by final year medical students. *Ulster Med J.* 2002;71(1):96.
6. Dieleman C, Duncan EA. Investigating the purpose of an online discussion group for health professionals: a case example from forensic occupational therapy. *BMC Health Services Research* 2013;13:253.
7. Wani SA, Rabah SM, AlFadil S, Dewanjee N, Najmi Y. Efficacy of communication amongst staff members at plastic and reconstructive surgery section using smartphone and mobile WhatsApp. *Indian Journal of Plastic Surgery: Official Publication of the Association of Plastic Surgeons of India* 2013;46(3):502-5.
8. Montassier E, et al. E-learning *versus* lecture-based in eeg interpretation for undergraduate medical students: a randomized noninferiority study. *Eur J Emerg Med.* 2014;10.
9. Nilsson M, et al. Evaluation of a web-based ECG-interpretation programme for undergraduate medical students. *BMC Med Educ.* 2008;8:25.
10. Nilsson M, et al. Does individual learning styles influence the choice to use a web-based ECG learning programme in a blended learning setting?. *BMC Med Educ.* 2012;12:5.
11. United Nations Educational, Scientific and Cultural Organization (UNESCO): *Mobile Learning and Policies: Key issues to consider.* place de Fontenoy, 75352 Paris 07 SP, France, 2012.