

Using a Journal Club Series to Introduce Paramedic Students to Research Fundamentals and Critical Appraisal of Medical Literature

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Conflicts of interest: none

Keywords: Emergency Medical Services; journal club; paramedic; research; research ethics

Abbreviation:

EMS: Emergency Medical Services

Received: December 25, 2018

Revised: April 5, 2019

Accepted: April 25, 2019

doi:[10.1017/S1049023X19004618](https://doi.org/10.1017/S1049023X19004618)

Abstract

Introduction: Despite United States national learning objectives referencing research fundamentals and the critical appraisal of medical literature, many paramedic programs are not meeting these objectives with substantive content.

Problem: The objective was to develop and implement a journal club educational module for paramedic training programs, which is all-inclusive and could be distributed to Emergency Medical Services (EMS) educators and EMS medical directors to use as a framework to adapt to their program.

Methods: Four two-hour long journal club sessions were designed. First, the educator provided students with four types of articles on a student-chosen topic and discussed differences in methodology and structures. Next, after a lecture about peer-review, students used search engines to verify references of a trade magazine article. Third, the educator gave a statistics lecture and critiqued the results section of several articles found by students on a topic. Finally, students found an article on a topic of personal interest and presented it to their classmates, as if telling their paramedic partner about it at work. Before and after the series, students from two cohorts (2017, 2018) completed a survey with questions about demographics and perceptions of research. Students from one cohort (2017) received a follow-up survey one year later.

Results: For the 2016 cohort, 13 students participated and provided qualitative feedback. For the 2017 and 2018 cohorts, 33 students participated. After the series, there was an increased self-reported ability to find, evaluate, and apply medical research articles, as well as overall positive trending opinions of participating in and the importance of prehospital research. This ability was demonstrated by every student during the final journal club session. McNemar's and Related-Samples Cochran's Q testing of questionnaire responses suggested a statistically significant improvement in student approval of exceptions from informed consent.

Conclusion: The framework for this paramedic journal club series could be adapted by EMS educators and medical directors to enable paramedics to search for, critically appraise, and discuss the findings of medical literature.

Maloney LM, Marshall RT, Werfel PA, Johnson SE. Using a journal club series to introduce paramedic students to research fundamentals and critical appraisal of medical literature. *Prehosp Disaster Med.* 2019;34(4):449–453.

Introduction

Despite learning objectives in the US National Standard Curriculum, which were updated in the US National Emergency Medical Services (EMS) Education Standards,^{1,2} many paramedics are not taught research fundamentals and how to find and critically appraise medical literature.^{3,4} Specific barriers have consistently been identified for the paucity of robust prehospital clinical research, including issues obtaining consent, and a lack of prehospital provider awareness of the importance of research and its clinical applications.^{3,5} Since 1998, six cognitive objectives have appeared in the US Paramedic National Standard Curriculum,¹ with further detail provided with the updated 2009 US National EMS Education Standards.² These include: “describe the importance of quality EMS research to the future of EMS; describe the importance and benefits of research; explain the EMS provider's role in data collection; explain the basic principles of research; [and] describe a process of evaluating and interpreting research.”¹

Even with these objectives, many paramedic training programs are not teaching the content, likely due to lack of educator comfort with the material and a lack of resources available to educators without research experience.^{3,4} Direct calls to action have been made for educational modules that can be adapted by programs to help educators meaningfully teach students these concepts.^{6,7}

To address the need for an educational module on research fundamentals and critical appraisal of medical literature that can be distributed to EMS educators and EMS medical directors, a four-part paramedic journal club was developed and implemented.

Methods

Curriculum Development

Using the US National Standard Curriculum,¹ the National EMS Education Standards,² and several reference texts,⁸⁻¹⁰ in conjunction with personal experience, a series of lesson plans was developed that focused on incorporating practical knowledge essential to finding and evaluating medical literature, into a short period of time. The first three journal club sessions were divided into a 30-minute lecture followed by a 90-minute interactive class discussion. First, the class chose a topic and were provided with related articles. The scientific method as it relates to the evaluation and treatment of patients was reviewed in the beginning of the session, and then the structural differences between randomized controlled trials, reviews, case studies, and letters to the editor were discussed. Second, the class chose a new topic, and was provided with a related trade magazine article. After a short lecture on the process of peer-review and publication, the class used different search engines (open access and utilizing library subscriptions) to verify the article's sources. The class picked another new topic for the third session, this time with students finding, downloading, and sending a PDF of a peer-reviewed article to the educator. The educator gave a statistics lecture and then critiqued the results section of several articles found by the students. For the fourth session, each student found a peer-reviewed article on a topic of personal interest and presented the article to the class as if they were telling their paramedic partner about it during down time between calls, taking no more than five to ten minutes. The overarching goals for these sessions were to be respectful of adult learning theory, while providing a practical, useful understanding of research practices.

Curriculum Implementation

The Stony Brook University IRB (Stony Brook, New York USA) reviewed the lesson plans and proposed assessment tools and deemed this "not research."

The journal club series has been run with three different paramedic student cohorts as part of a university hospital-based paramedic program (2016, 2017, and 2018). Minor adjustments to the slides have been made based on feedback.

Before and after the journal club series, the 2017 and 2018 cohorts completed questionnaires containing demographic questions and Likert-style questions about research perceptions which were largely derived from other studies,^{7,11} and beta tested on 10 paramedics and 10 emergency medical technicians with diverse educational and work experience. One year after graduation, the 2017 cohort received a follow-up questionnaire.

Statistical Analysis

Given the preliminary nature of this study, in conjunction with its incorporation into the standard paramedic program curriculum at this institution, all enrolled paramedic students were included. Questionnaire responses were linked with student-generated unique

identifiers. Statistical analysis was performed using SPSS Statistics Faculty Pack 25 (IBM Corporation; Armonk, New York USA). Descriptive statistics were used for demographic data. Research perception responses were collapsed into "agree" (strongly agree, agree) and "not agree" (neutral, disagree, strongly disagree). McNemar's Test was used for analysis of the pre- and post-questionnaire research perception responses. Related-samples Cochran's Q testing with adjusted P values was used to compare responses of individuals from the 2017 cohort who completed all three questionnaires.

Results

During the 2016 cohort, 13 students participated in the journal club series and provided qualitative feedback. During the 2017 and 2018 cohorts, 21 and 12 paramedic students participated, respectively. Of the students in the 2017 cohort, 20 became paramedics, of whom 15 completed the one-year follow-up survey (response rate of 75%).

Student comments from the 2016 cohort included:

The final session was great; it was useful to review research articles and present to the class. This should be emphasized further.

Having the option to research a topic about EMS that [was interesting] was helpful because not only [was knowledge gained] from the research, but [students] were able to feel more comfortable presenting a topic [of] previous interest.

Presenting in front of the class is not something that I was looking forward to, but afterwards thought it was very helpful.

Of the 33 paramedic students in the 2017 and 2018 cohorts, the mean age was 24 years (range 18-45), with mean years of experience in EMS of four (range 0-28). A majority were men (76%; n = 25) and many held college degrees (n = 16; 48%). Before the start of the journal club series, 13 students (39%) indicated they had a subscription to a research journal, writing in the *Journal of Emergency Medical Services* (n = 9) and *EMS World* (n = 6) when asked for the name of the journal. None wrote the name of a peer-reviewed journal. Students reported reading research articles weekly (n = 1; 3%), monthly (n = 15; 46%), yearly (n = 11; 33%), and never (n = 6; 18%). Barriers to reading medical research articles included not having enough time and not knowing where to find them. When asked how they stay informed on advances in medicine, students selected talking with friends, going to continuing medical education classes, reading medical research articles, reading blogs, listening to podcasts, and using Facebook (Facebook Inc.; Menlo Park, California USA), in descending order of popularity.

Table 1 describes student responses to the research perception questions. After the journal club series, there was an increase in self-reported abilities to find, evaluate, and apply medical research articles, which was demonstrated by each student during the fourth session. Additionally, there were overall positive trending opinions of participating in and the importance of prehospital research. A statistically significant improvement was observed in student approval of exceptions from informed consent.

In the one-year follow-up survey, comments included:

Learning how to read and analyze research articles not only molded me into a more confident provider, it also influenced me to advocate for the creation of a journal club at my job! [Agency] medical directors have been extremely engaged and it [has] opened the door to a lot of discussion between the doctors and the field employees.

The time spent [during] journal club was time well spent. In hindsight, I wouldn't trade it for another type of training or education.

Statement	Student Agreement Before % (n)	Student Agreement After % (n)	Student Agreement 1 Year Later % (n)	P Value
Research in prehospital emergency medicine is important.	100% (33)	100% (33)	100% (15)	
My protocols are based on evidence generated from clinical trials.	79% (26)	79% (26)	53% (8)	
I know how to find medical research articles.	73% (24)	100% (33)	93% (14)	
I am able to understand medical research articles.	79% (26)	91% (30)	93% (14)	
I am able to apply medical research articles to how I assess and treat my patients.	58% (19) ^a	82% (27) ^a	80% (12)	P = .039 ^a
My protocols should be based on evidence generated from clinical trials.	85% (28)	91% (30)	100% (15)	
When making a decision about patient care, it is more important to use personal experience than research-based evidence.	24% (8)	18% (6)	13% (2)	
As a professional, I am responsible for staying informed on advances in medicine.	100% (33)	100% (33)	93% (14)	
I would be interested in participating in a clinical trial as a provider, as long as appropriate training and support were provided.	97% (32)	94% (31)	93% (14)	
Spending an extra five minutes completing paperwork related to a clinical trial after the end of a call would be an unacceptable burden.	9% (3) ^a	33% (11) ^a	13% (2)	P = .039 ^a
More prehospital research would improve patient care provided by EMS.	94% (31)	97% (32)	93% (14)	
Given proper training, I would feel comfortable involving a patient in a clinical trial.	82% (27)	88% (29)	87% (13)	
My protocols are updated to reflect new research findings in a timely manner.	27% (9)	33% (11)	27% (4)	
Sometimes bettering the knowledge and care for a large group of people means it's okay to limit an individual's rights.	18% (6)	39% (13)	20% (3)	
If I was a patient, and was too sick to communicate, I would want a provider to involve me in a clinical trial if it has the potential to benefit me.	49% (16)	61% (20)	60% (9)	
Medical researchers, in general, act in the best interest of the patients they are taking care of.	49% (16)	67% (22)	60% (9)	
If my patient was too sick to give direct consent to be involved in a clinical trial that may benefit them, it would be okay to include them, if the hospital gets consent from them once they are stabilized.	33% (11) ^a	73% (24) ^a	33% (5)	P = .002 ^a
I would be interested in attending a journal club as part of continuing medical education.	67% (22)	82% (27)	93% (14)	
I would be interested in reading a medical research article and completing a short quiz on it as part of continuing medical education.	79% (26)	88% (29)	80% (12)	
As a result of this class, I am more inclined to read medical research articles.		76% (25)		
As a result of this class, I am more likely to be interested in participating in a prehospital clinical trial, as a provider.		76% (25)		
As a result of this class, my opinion on the value of prehospital research has changed.		67% (22)		
This class was a productive use of my time.		85% (28)		
I would recommend the content of this class to my coworkers.		88% (29)	87% (13)	
I am glad I was able to participate in a paramedic journal club as a student.		85% (28)	93% (14)	

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Table 1. Paramedic Student Responses on Questionnaires Given Before, After, and 1-Year After the Journal Club Series
(continued)

Statement	Student Agreement Before % (n)	Student Agreement After % (n)	Student Agreement 1 Year Later % (n)	P Value
I believe the critical thinking I learned in my paramedic journal club has been helpful during my first year as a paramedic.			80% (12)	
I have found and critically evaluated medical research articles over the past year.			67% (10)	
Critically evaluating medical research articles has affected how I treat and evaluate some of my patients.			60% (9)	

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Table 1 (continued). Paramedic Student Responses on Questionnaires Given Before, After, and 1-Year After the Journal Club Series

Note: A total of 33 students took the before and after questionnaires, and 15 completed the 1-year follow-up questionnaire. When comparing the responses from the 1-year follow-up questionnaire to those just after the journal club, only the data from the responding 15 providers were included.

Abbreviation: EMS, Emergency Medical Services.

^aDenotes the questionnaire iterations the P value pertains to.

<p>Series Objectives:¹</p> <ul style="list-style-type: none"> • 1-1.18 Describe the importance of quality EMS research to the future of EMS. • 1-1.34 Describe the importance and benefits of research. • 1-1.35 Explain the EMS provider's role in data collection. • 1-1.36 Explain the basic principles of research. • 1-1.37 Describe a process of evaluating and interpreting research.
<p>Session 1:</p> <ol style="list-style-type: none"> 1. Describe three similarities between the scientific method and the evaluation and treatment of a patient with chest pain. 2. List three different formats for medical research articles.
<p>Session 2:</p> <ol style="list-style-type: none"> 1. Describe the peer-review process of a manuscript. 2. Name two research search engines. 3. Describe the difference between open access and subscription-based access. 4. Name three open access, peer-reviewed journals.
<p>Session 3:</p> <ol style="list-style-type: none"> 1. Describe the difference between dependent and independent variables. 2. Describe the importance of a control group. 3. List two ways parametric data can be evaluated. 4. List two ways non-parametric data can be evaluated. 5. Explain the significance of a P value.
<p>Session 4:</p> <ol style="list-style-type: none"> 1. List three safeguards in place to protect patients involved in research studies. 2. Describe the role of an Institutional Review Board. 3. Name three types of consent used in human subjects' research.

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Table 2. Journal Club Series Learning Objectives

Discussion

Overall, the journal club series has been well-received by students. Some debate has occurred about when during the paramedic course the journal club would be most efficacious. Some believe having the series earlier allows more time for students to refine the skill and find reliable resources when questions arise. Currently, the series runs at the end of the program during the Paramedic Internship when less new material is introduced, which allows for more attention when preparing for the sessions. It has also been challenging

determining which parts of the articles students read at home; however, asking students to read the Abstract and Introductions at home seems reasonable as both contain limited jargon. Then, students are asked to volunteer to summarize these sections when the discussion starts to allow some context for those who did not read, or understand, the assignments at home. Finally, after the 2018 iteration of the series, a misunderstanding of the IRB, consents, and medical ethics was observed and thus a lecture was added to the beginning of the fourth session (Table 2).

Going forward, sharing this educational module, complete with lesson plans, slides, and annotated accompanying articles, could allow EMS educators and medical directors to adapt it to their programs. While textbook publishers' slides may have essential definitions, the actual practical application of the process and ability to practice communicating findings to others is incredibly valuable to the students as they prepare to become life-long learners. Moreover, it is the responsibility of educators to provide students with the tools to find and critically appraise news about advances in medicine, especially in the age of social-media-driven information, and personal blogs and podcasts.

Additionally, this module could be adapted by agency medical directors for continuing medical education classes to discuss the evidence protocols are based on, and perhaps debunk harmful medical trends or misconceptions. It has been suggested that showing providers how research findings directly impact and improve the patient care they provide, and acknowledging their clinical expertise as prehospital providers,^{3,12} could increase their buy in to participating in future research, which seems to be an excellent use of time and resources.

Limitations

Limitations of the study include that it was performed at a single center, and while multiple cohorts of paramedic students were included, the overall number of participants was small. In addition, this study relies on student self-reported opinions, not actually demonstrated behaviors.

Conclusion

This paramedic journal club series allowed for paramedic students to have a self-reported increase in understanding of multiple areas of research, and suggested an increased willingness to participate in future clinical research. Most importantly, each student demonstrated the ability to find, critically appraise, and discuss the findings of medical research literature. The positive reception of this curriculum suggests this module could be adapted by EMS educators and medical directors as a meaningful addition to paramedic initial or continuing education.

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