ORIGINAL RESEARCH

Formal Testing and Utilization of Streaming Media to Improve Flight Crew Safety Knowledge

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Abstract

Increased concerns over the safety of air medical transport have prompted development of novel ways to increase safety. The objective of our study was to determine if an Internet streaming media safety video increased crew safety knowledge. 23 out of 40 crew members took an online safety pre-test, watched a safety video specific to our program and completed immediate and long-term post-testing 6 months later. Mean pre-test, post-test and 6 month follow up test scores were 84.9%, 92.3% and 88.4% respectively. There was a statistically significant difference in all scores ($p \leqslant 0.01$). Streaming media proved to be an accessible and effective supplement to safety training in our study.

Introduction

Although the safety of air medical transport has always been a concern, a recent rise in the absolute number of accidents has increased these worries.[1] Flight crew safety knowledge is instrumental in potentially reducing the number of these accidents. Flight programs rely on safety training to increase crew knowledge. However, their training format is program specific, and the optimal method of delivery and frequency of education is undetermined.

Streaming media allows delivery of audio and video content though the internet to a computer with a supported media player, allowing the user to view video and audio content during download. Media can be accessed at any time and location, obviating the need to distribute multiple copies of videotapes or DVDs or for attendance at lectures.

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In response to increased safety concerns, we produced a safety video specific to our program, aircraft, and procedures. The purpose of this study is to evaluate the short-term and long-term efficacy of streaming media in air medical crew safety education.

Methods

UW Med Flight is a university-based helicopter medical transport service located in south central Wisconsin. The program operates two aircraft and has had over 20,000 consecutive accident-free missions over 20 years. Program pilots conduct standard crew safety training by reviewing monthly safety topics and giving a comprehensive safety briefing at the aircraft every 6 months.

A comprehensive safety video was produced for this study. The content of the safety video was based on our aircraft operator's required comprehensive safety briefing outline. Additional safety content specific to our program was included at the discretion of our chief safety officer. The content of our safety video is found in Table 1. The video was recorded by the principal investigator and research assistant. The video was edited and rendered using Sony Vegas video editing software. The raw video was rendered to a Real Media (RM) file and uploaded to our web server. The RM file was streamed using Helix Server Basic on a Linux operating system.

Crew were asked to take a 30-question online safety examination specific to the video content (Table 1) and randomized from a pool of 51 questions. Questions were written by one of our senior pilots and assigned to 1 of 15 categories (Table 2). Two questions were selected from each category. The software for online testing was written by the principal investigator using the PHP programing language and a MySQL database. The questions were randomly selected from the database by the software script, using the MySQL RAND() function. The initial examination was given to assess baseline knowledge. Crew completed a similar randomized test after viewing the video. Scores were recorded in a database and available to the user after completing the examination. Incorrect answers were flagged and correct answers displayed for the user. Crew were asked to repeat the examination before their 6-month safety briefing to assess

Table 1. Topics Included in Safety Video

Patient loading and unloading
Securing aircraft doors and compartments
Crew approach to aircraft
Hot unloading
Rotor avoidance
Identification and reporting of obstacles and air traffic
Securing of equipment, crew and patients
Emergency equipment
Fire extinguishers
Survival pack
Emergency procedures
Fire
Crash position
Emergency egress
Precautionary landing
Oxygen shutoff
Aircraft shutdown
ELT
Communications
Sterile cockpit
Hazardous material
Safety at public relations events
Hangar orientation
Eye wash station
Hangar fire suppression and fire extinguishers
Safe operation of hangar doors
Fuel shutoff switch
Fire alarm activation
Helipad safety
Fire suppression
Fuel shutoff switch
Crew briefing and debriefing
Advocacy and assertion

Table 2. Safety Categories Included in Exam

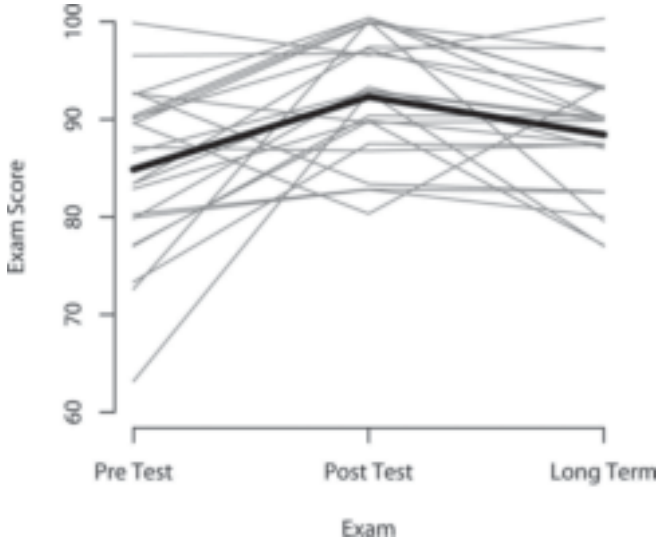
Hangar orientation
Approach and departure
Emergency equipment
Emergency procedures
Communications
Reporting injuries and hazards
Hot loading and unloading
Environmental hazards
Patient safety and restraint
Hazardous materials
Survival training
Operator safety policy
Aircraft orientation
Traffic watch
Mission briefing and debriefing

knowledge retention. Changes in examination scores were assessed using paired *t*-tests. A *P*-value of .05 was regarded as statistically significant. The project was originally intended as a quality improvement project for our program. Retrospective institutional review board approval was obtained to share our results with the air medical community.

Results

Forty staff were asked to participate in the study. Twenty-three were willing to participate and completed the safety pretest, posttest, and 6-month follow-up examination. At the pretest, the mean examination score was 84.9% (SD, 8.7). Posttest scores averaged 92.3% (SD, 6.3) and increased by 7.4% (95% CI, 3.2−11.6; $P = .001$). Long-term examination scores averaged 88.4% (SD, 6.2) and declined by 3.9% (95% CI, 1.0−6.8; $P = .01$) relative to posttest scores, but remained 3.6% (95% CI, 0.9−6.3; $P = .01$) higher than baseline scores. Figure 1 displays examination scores for all participants. The mean time between completion of the pretest and posttest was 12 days. The mean time to completion of the 6-month follow-up examination from the posttest was 164 days.

Figure 1. Examination Scores



Discussion

There was a statistically significant increase in knowledge after viewing the online safety video. Whether a statistically significant increase in safety knowledge will practically improve flight crew safety is unknown. However, a crew member who has learned to properly operate a fire extinguisher or operate a safety exit may make a significant difference for all during an emergency. Although test scores declined over time, they continued to show a statistically significant improvement above baseline. These data suggest that streaming media is an effective tool both in increasing short-term safety knowledge and in maintaining a statistically significant degree of knowledge retention in our study.

Safety training will be revised at our program based on these results. Traditionally, formal comprehensive safety training was performed at the aircraft every 6 months. We will continue to hold daily crew briefings with discussion of a monthly safety topic. However, we will now require comprehensive training every 3 months. For example, a comprehensive safety briefing at the aircraft will be required at the beginning of a training cycle. Three months after the standard briefing, the crew will be required to take the safety examination and review any incorrect answers with the pilot on duty. The comprehensive live safety briefing will be required again 3 months after taking the safety

Continued on page 98

bypass, and of those, 15 survivors resumed their former activities and lifestyles. In this group, there were either no hypothermia-related neurologic deficits or only mild ones. "However, there were five additional factors that may have contributed to this high survival rate. First, hypothermia was deep and therefore protective in the patients studied. Second, none of the patients had asphyxia or hypoxic brain damage before hypothermia developed. Third, the surviving patients were young and in good general health with no vascular risk factors. Fourth, the infrastructure and experience of the EMS system in Switzerland was mentioned, and emphasized that hypothermia was maintained and the patients were rewarmed only after cardiopulmonary bypass was initiated. The fifth and most crucial factor may have been that rewarming was done early in the resuscitation. Regardless of these factors, both the high survival rate in this study and the long-term outcome are remarkable!"[10] These amazing cases reinforce to those of us in EMS the truth of the old axiom: "Not dead until warm and dead."

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Air Medical Evaluation
Continued from page 93

mask may be considered safe as radiographically documented before and after a 20-minute helicopter flight in an otherwise cardiorespiratory stable patient.

We therefore ask the question of whether a small spontaneous thoracic airleak is truly an absolute contraindication for low-altitude air evacuations, especially in a setting of limited resources and expertise.

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Formal Testing and Utilization
Continued from page 85

examination, 6 months from the original formal briefing. Crew will be required to view the safety video 3 months later. The cycle will thus repeat with standard briefing at the aircraft at time 0. This may compensate for knowledge decay, as has been identified to occur by other studies, at or before 6 months after an educational intervention.[2-4] Future studies addressing knowledge retention at shorter intervals should be conducted to determine an optimal frequency of safety training.

Conclusion

Streaming media and online testing can be an effective method of supplementing air medical safety training. Easy accessibility and availability of internet streaming are advantageous for repeat training because retention of knowledge declines over time.

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