Diffusion of Medical Progress: Early Spinal Immobilization in the Emergency Department

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Abstract

Objectives: To examine the spread of new techniques of spinal care through one state’s emergency departments (EDs).

Methods: This was a telephone survey of all 36 EDs in a single state. One physician from each ED was contacted and given a short structured survey instrument to determine when patients who arrived at the ED on backboards were removed from the backboards. Removal was classified as “immediate” if it was done before clinical or radiographic exclusion of cervical spine injury and “delayed” if it was done only after interpretation of any indicated diagnostic radiologic procedures. Further questions were asked to determine if all physicians in the group used the same technique and how this technique had been adopted.

Results: In all but four hospitals, patients were removed from backboards in the same manner by all physicians, using a protocol or standard procedure. Fifteen of these did immediate and seventeen did delayed removal. In all but one case, the approach of immediate removal was initiated at the hospital by a physician trained or recently working at a university facility. Eight respondents stated that transport service requirements influenced their decision.

Conclusions: Although logic and the medical literature support removing all patients from a backboard immediately, physicians were unlikely to change their practice after their formal training had been completed until a new member of their group had done so.

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Changing behavior is difficult. An entire subdiscipline of sociology is devoted to determining how new behaviors are adopted by individuals and groups.1 Several thousand academic papers address these issues, and much is now known about how innovations are disseminated through social groups. New behaviors are easiest to adopt when they are perceived as having certain attributes. Specifically, they must be simple to understand and perform, have relative advantages over the behavior they are to replace, be compatible with previous beliefs, be easily tested, have observable effects, and be low risk.1

Behavior adoption within groups occurs by a process that includes knowledge acquisition and local persuasion. Knowledge acquisition usually occurs through media and is generated by individuals who are different socially from the adopting group members. Persuasion occurs when individuals who are viewed as similar adopt the new behavior. This sets a barrier to new behaviors because only unusual members of a group are willing to be the first to adopt them. As a result, adoption is initially slow and may require new immigrant group members to initiate. Adoption by respected local leaders is often necessary before most group members are willing to change. Once a critical mass of members adopts a new behavior, acceptance by other members is usually rapid.1

We examined the adoption of a new behavior among emergency physicians. We chose to look at the time trauma patients were removed from backboards because it represents a simple quantifiable behavior and is not driven by overt external factors such as advertising (e.g., in the case of new drug adoption). We hypothesized that adoption was socially driven.

METHODS

Study Design and Population
This was a telephone survey of all full-service emergency departments (EDs) in the state of New Mexico performed during the first two months of 2007. The study was ruled exempt from informed consent by our institutional review board.
The on-duty emergency physician in each ED was contacted by the senior author and given a short structured survey instrument as part of a larger survey sponsored by the New Mexico Chapter of the American College of Emergency Physicians. The entire survey was designed to take less than 10 minutes to administer. The state is geographically large (sixth largest in the United States) with a population of only about two million. Although parts are very rural, the majority of the population lives in or near the central Santa Fe/Albuquerque corridor. The state has 36 full-service EDs, six of which are parts of two multihospital groups (three hospitals in each group). Hospitals include one university teaching hospital, a Veterans Hospital, and three hospitals run by the U.S. Public Health Service. The remaining hospitals include both for-profit and not-for-profit facilities. ED volumes range from less than 2,000 to more than 70,000 patients per year. One ED is staffed primarily by physician assistants; this facility was included in the study. Specialty hospitals such as rehabilitation, cardiac, and psychiatric hospitals that do not generally treat patients with acute injuries were excluded. The New Mexico Medical Board lists 4,213 medical doctors practicing in the state. A total of 189 are listed as emergency physicians, 96 of whom are board-certified. In addition, 236 doctors of osteopathy are listed; these have no assigned specialty.

Survey Content and Administration
The survey asked “We are interested in how physicians treat patients with possible spinal injuries: specifically when do you take patients who arrive on backboards off them?” The physician was then asked “Why do you do it then?” and “Do all physicians at your hospital remove the board at the same time? The physician was asked “Why do they [the other physicians] do it then.” Further questions were asked as needed to clarify the responses. Respondents were allowed to comment further if they desired. All responses were recorded verbatim on the survey instrument. Technically this was a purposive, open-ended sample of experts. We tested the robustness of our method by resampling different physicians at 20% of the EDs.

Data Analysis
Several possible times of removal are possible, including upon arrival, before clinical or radiographic analysis, after radiographic procedures are performed but before they are interpreted, after they are interpreted, and after transfer or hospital admission. We prospectively classified removal from the backboard as “immediate” or “delayed.” Removal was defined as immediate if it was done before exclusion of spinal injury. It was defined as delayed if it only occurred after spinal injury had been excluded by clinical or radiologic criteria. Patients in the delayed group who actually did have spinal injuries would remain on a board until they became inpatients or were transferred to a tertiary care hospital.

Our formal null hypothesis was that physician treatment decision would be independent of group membership, in other words, that adoption of a protocol was an individual act rather than a socially-mediated one. If this were true, then adoption would occur at random times for all physicians and not be clustered by group membership. We assumed a group size of six physicians and that the distribution was 0.5 for each treatment. Probability statistics and the binomial expansion were used to calculate the final results. Use of this method requires that the latter assumption be approximately true; if all physicians use the same method, then nothing can be determined about how they acquired it.

RESULTS
In 32 of the 36 hospitals (89%), physicians removed all patients from backboards in the same manner using a protocol or standard procedure. Fifteen of these EDs used immediate and 17 used delayed removal. In all but one case, the approach of immediate removal was initiated at the hospital by a physician recently trained or working at a university facility. The exception was a facility that served as a regular rotation for the university’s emergency medicine residents. This facility changed to immediate removal after discussion between university faculty and the private physicians. In only four facilities (11%) did physicians use different or “mixed” methods. At all of these, immediate removal was done only by physicians who had recently come from a university training program.

The distribution was nearly 0.5 for each treatment (percentages for the heterogeneous groups were not known, but most of the larger groups were among the 15 immediate groups). The assumption of a six-member group size proved conservative; counting occasional and locums physicians, no group was smaller than this.

If there are two possible treatments, and each is equally likely to be used and adopted by physicians independent of which group they are in, then the probability that all physicians in a group with X members would use the same procedure is 0.5X-1. For a six-member group, this is 0.03125. The probability that 32 of 36 six-member groups would be homogeneous is 0.03125 · (36! / (32! · 4!)) · 0.031252 · (1 – 0.03125)4 = 3.55 · 10-44. The probability of 32 or more homogeneous groups is about 3.56 · 10-44. This is highly unlikely to be due to chance (p < 0.001), and the null hypothesis is disproved.

Many hospitals were unable to definitively treat unstable spinal injuries and transferred these to tertiary care centers. Different transport services required either that patients be removed from boards (three facilities, all in the immediate group) or that they be transferred on a board (two in the delayed group, one in the immediate group, and one in the mixed group). One facility in the immediate group used two transport services with different requirements. In the seven EDs sampled twice, the responses were identical both times.

DISCUSSION
Patients with potential spine injuries generally arrive in the ED on hard boards designed to allow easy extrication from the crash site. Patients rapidly develop tissue ischemia in areas in contact with the board, and ischemic pain becomes intolerable within minutes. The slippery surface makes movement relatively easy, and a system of straps, tape, and ancillary devices is necessary to keep patients relatively still. However, when mechanically “immobilized” patients attempt to move off ischemic areas, they concentrate forces at specific locations rather
than dissipate them. The underlying physical and biomechanical facts that justify early removal would be known to all practicing physicians. That energy deposition and not motion per se is the cause of material change and injury in tissue is simply elementary physics. That all patients with biomechanically unstable spinal injuries are treated on soft hospital mattresses to avoid tissue ischemia would be obvious to physicians who had cared for such patients during training or practice. Because all patients are removed from backboards eventually, either when a biomechanically unstable injury is ruled out or to prevent complications and facilitate long-term care of the definitely injured patient, there is no logical reason to keep patients on a backboard after ED arrival. All surveyed physicians did remove patients from backboards regularly and were aware that all boards would need to be removed eventually. Immediate removal should then be compatible with previous beliefs.

In addition, early removal is no more difficult to perform than late removal, it is easily testable, and it has observable effects on ease of care and patient comfort. The risk to the physician of early removal is low, at least compared with most behaviors studied by sociologists such as agricultural crop change, which could result in bankruptcy or starvation. All of these factors would be expected to allow easy adoption of immediate board removal. However, the advantages accrue primarily to patients rather than to providers, and fear of litigation undoubtedly provides a disincentive to change. This clearly results in a relatively low perceived advantage to physicians. It is apparently only when new methods of spinal care are imported into ED groups by new physicians that conversion to the new system occurs. Adoption is then rapid, as demonstrated by the fact that few groups were heterogeneous.

In eight cases, spinal care was at least partly based on the requirements of the transport services used to transfer trauma patients to referral facilities. This is described in the sociology literature as “authority-mandated change.”

LIMITATIONS

Only one state was surveyed. Physicians were not subdivided by specialty training or years of practice. Although the technique of having a vested expert conduct the survey is a standard one in the social sciences, it would be subject to bias if respondents were aware of the investigator’s own preferred method and unwilling to admit their own. It is possible that some of the surveyed physicians were unaware of the actual practice patterns of the other physicians in their group. The resurvey decreases the likelihood of the latter problem but does not eliminate it.

CONCLUSIONS

A simple and logical change in patient care was not independently adopted by the physicians studied. Knowledge, ease of change, and perceived advantage were not adequate to cause behavioral change by themselves. Although the medical literature supports removing all patients (regardless of their injury status) from a backboard immediately after hospital arrival, physician behavior is socially driven; physicians are unlikely to change their practice until another member of their group has done so. In almost all cases this was a new member, fresh from an academic center. Direct personal contact with a respected peer appears to provide the motivating factor for actual change. Changing the practice of providers who can “mandate” or influence treatment, such as physicians accepting transfers and directing transport services, might also be effective when attempting to advance patient care.

References