Finding Factors Associated With Post–Emergency Department Morbidity and Mortality in Elderly Patients: Analyzing a Case-Control Study

Answers to the July 2016 Annals of Emergency Medicine Journal Club

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Editor's Note: *You are reading the 52nd installment of* Annals of Emergency Medicine *Journal Club. This Journal Club refers to the article by Gabayan et al*[1] *published in the July 2016 edition of* Annals*. Information about journal club can be found at http://www.annemergmed.com/content/journalclub. Readers should recognize that these are suggested answers. We hope they are accurate; we know that they are not comprehensive. There are many other points that could be made about these questions or about the article in general. Questions are rated "novice" (NOV), "intermediate" (INT), and "advanced (ADV) so that individuals planning a journal club can assign the right question to the right student. The "novice" rating does not imply that a novice should be able to spontaneously answer the question. "Novice" means we expect that someone with little background should be able to do a bit of reading, formulate an answer, and teach the material to others. Intermediate and advanced questions also will likely require some reading and research, and that reading will be sufficiently difficult that some background in clinical epidemiology will be helpful in understanding the reading and concepts. We are interested in receiving feedback about this feature. Please e-mail journalclub@acep.org with your comments.*

DISCUSSION POINTS

1. A. (INT) The accurate identification of predictors associated with patient morbidity and mortality may be critically important to patient management. However, these predictors are often challenging to reliably ascertain. Describe some of these challenges that are applicable to all emergency department (ED) patients. Discuss the unique challenges in the elderly ED patient population.

(NOV) B. The primary decisions of study population and outcomes are suitable for a number of reasons. Why did the authors limit the study population to elderly patients who were discharged from the ED? What could have been confounders in this population of the primary outcomes: "combined poor outcome of either death or an ICU admission shortly after ED discharge"?[1]

(INT) C. This study was a case-control design. Why might investigators choose a case-control study design instead of a cohort study? Name at least 2 key characteristics of the problem to be investigated that play into this decision. Describe the advantages and disadvantages of a case-control study compared with a cohort study. How does the investigator determine the appropriate number of controls for each case?

(INT) D. How might you have designed a cohort study that used existing data to investigate the primary study outcome? Would you have imposed the same inclusion and exclusion criteria on the study population? What if you conducted a cohort study in which you collected new data?

2. A. (NOV) This study examined a set of predetermined variables and measured whether they were associated with the composite outcome of death or ICU admission shortly after ED discharge. Why might investigators identify potentially important clinical predictors a priori versus relying on regression analyses to identify predictors? Might there be disadvantages to predetermined potential predictors?

(INT) B. Clinical variables (eg, age, systolic blood pressure) may be recorded and analyzed as continuous, ordinal, or binary (ie, dichotomous) terms. Define each of these terms and provide an example for each, using patient age. Variables in this article were treated as binary rather than continuous for the purposes of analysis. What are the pros and cons of converting continuous variables to binary terms?

(ADV) C. A study's design can increase or decrease the possibility of confounding (bias). Please comment on how each of the following factors might affect the likelihood of confounding.

i. use of paired controls

ii. exclusion of do not resuscitate patients, do not intubate patients, and hospice patients

iii. patient selection (consider demographics, socioeconomics, etc)
iv. selection of periods (patient data period, poor outcome period)
v. variable selection
vi. chart abstractor training and work processes
vii. modeling
viii. inclusion of against medical advice patients in "change of disposition" parameter

NOV D. In this article, the quality of the data relies heavily on the quality of the assessments of the chart abstractors. For all assessments conducted by chart abstractors, what else could be done to mitigate effects of human error on the quality of analysis?

3. NOV A. What other variables (eg, patient lives alone, history of dementia) would you have included in the study analysis? How would you define those variables (eg, normal with X range of values, abnormal with Y range)? Consider if the model included a patient's social support system. What would you expect the association between that and the combined poor patient outcome to be?

NOV B. In the selected model, variables related to consultants were left out. Explain this decision by the authors. Why is this justifiable? Consider the overall goal of the article.

NOV C. Will this study change clinical practice at your hospital? Support your opinion.

ANSWER 1

Q1.a The accurate identification of predictors of patient morbidity and mortality may be critically important to patient management. However, these predictors are often challenging to reliably ascertain. Describe some of these challenges that are applicable to all emergency department (ED) patients. Discuss the unique challenges in the elderly ED patient population.

All ED patients:

a. Some factors are easy to identify but difficult to quantify, such as social factors, psychological temperament, level of faith, general intelligence, and desire to live.
b. Some factors are easy to identify and quantify but difficult to gather, such as lifetime tobacco or radiation exposure.

In addition to the above, the elderly population has additional barriers in achieving an accurate set of factors in this predictive model:

a. cognitive capacity of patient to provide accurate data
b. unwillingness to engage through modern research conduits such as smartphones, computer-administered surveys, or automated telephonic surveys
c. complexity of each individual, given total years lived

Q1.b Why did the authors limit the study population to elderly patients who were discharged from the ED? What could have been confounders in this population of the primary outcomes: "combined poor outcome of either death or an ICU admission shortly after ED discharge"?[1]

The study population was ideal for 2 reasons. First, the elderly population likely has the highest yield in the chosen outcome irrespective of whether they were discharged from an ED or not. Second, although a younger population could have been included, this would likely weaken the association of the explanatory factors and the outcome because different factors play a role in the outcome of death or ICU admission after ED discharge in a younger population.

The study could have been confounded by factors that led to discharge not because the physicians wrongly assumed that the patient was at low risk for deterioration but because a decision was made to discharge the patient despite a high risk of deterioration. This could occur if a patient were receiving hospice care or were thought to have a better chance at home than in the hospital even though outlook was poor for both choices. The presence of such patients in the group scored as "having the outcome" might confound a study designed to predict what factors are associated with *unanticipated* poor outcome.

Q1.c This study was a case-control design. Why might investigators choose a case-control study design instead of a cohort study? Name at least 2 key characteristics of the problem to be investigated that play into this decision. Describe the advantages and disadvantages of a case-control study compared with a cohort study. How does the investigator determine the appropriate number of controls for each case?

Investigators may choose a case-control study design when a disease is rare or there is a long interval between the exposure and development of the disease. The financial and logistic requirements of a cohort study make that study design not feasible to conduct for rare conditions because of the massive number of patients that would be needed to capture the required number of patients with the disease. The same limitations apply when the development of a disease is investigated many years after an exposure (eg, investigating whether exposure to an artificial sweetener as a teenager is associated with increased risk of solid organ tumors after aged 50 years).

Case-control studies provide a structured, although less methodologically robust, study design for studying such conditions. Readers interested in a more detailed discussion