

Breaking the Law of Small Numbers

See Article by Sax et al

I always avoid prophesying beforehand because it is much better to prophesy after the event has already taken place.

—Winston Churchill

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Over 50% of all hospital admissions originate from the emergency department (ED), supporting the popular belief that the ED admits too many patients. Although the ED is the source of most admissions,¹ the truth is most patients seen in the ED actually go home. Of 141 million annual visits to EDs in the United States, only 12.6% result in admission.² When it comes to acute heart failure (AHF), however, the perceived reality is in fact true. The ED admits ~85% of patients who present with AHF, accounting for ~80% of the >1 million AHF hospitalizations per year.^{3,4} Many patients with AHF clearly require acute care; but is it truly 8 of every 10 patients?

What do the data tell us? Unfortunately, little. Despite countless assertions that more patients with AHF should be sent home, supporting evidence is lacking.^{5,6} The most robust data come from our Canadian colleagues^{7,8}; perhaps, we should simply extrapolate their data to the US setting. However, this highlights the surprising paucity of US data on outcomes of patients discharged from the ED with AHF. If we do extrapolate, current data suggest that patients discharged from the ED have worse outcomes than hospitalized patients!⁷ Our clinical gestalt to discriminate high from low risk seems poor.

Unlike chest pain and the rule-out risk-scores or risk-stratification instruments for acute coronary syndromes, no universally accepted tools exist for AHF.⁹ Several promising ED-based AHF risk instruments have been proposed both outside and within the United States^{8,9} but are not ready for prime time. They either (1) have not been well validated in a US cohort, (2) complexity hinders use, or are (3) based on a hospitalized cohort admitted through the ED rather than directly discharged. Plenty of hospital-based AHF risk instruments exist¹⁰; applying them to the ED setting almost certainly identifies lower risk patients. However, using inpatient tools to discharge ED patients ignores a major confounding factor, the impact of hospitalization on risk. Furthermore, what is low risk? For chest pain, 0.5% to 1.0% major adverse cardiovascular events seem to be the acceptable threshold. A survey of emergency physicians about AHF also supports this threshold, with an important caveat directly related to this study; 0.5% to 1.0% risk at 30 days post-discharge.¹¹

The major limitation to development of robust ED risk-stratification instruments is the lack of data. In this issue of the *Circulation: Heart Failure*, Sax et al¹² provide critical and welcome information on outcomes of discharged patients with AHF from a group of EDs within an integrated health system. In their observational, retrospec-

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tive cohort study of >7000 patients, only 1.2% of discharged patients died within 7 days, 4.7% were rehospitalized, and 7% returned to the ED (all exclusive counts). Although not zero, arguably this mortality rate is low. However, by 30 days, 3.85% of patients had died and 13.5% were rehospitalized, a rate significantly higher than what most emergency physicians would accept.¹¹

Importantly, Sax et al¹² analyzed when the event occurred as well as primary care or cardiology follow-up within the 30-day period. Although events do occur early, most events occur after the 7-day period. No significant differences in follow-up within 1 week were observed between those patients who did or did not experience an adverse outcome. Nearly 50% of patients were seen by a noncardiologist in both groups and ≈10% were seen by a cardiologist.

After adjustment, the authors found current or former smokers as well as sicker patients defined by the Laboratory-based Acute Physiology Score 2 (an illness severity score based on laboratory markers and vital signs) to be more likely to experience the primary composite outcome of death, hospitalization, or ED visit within 7 days. Of note, they also found 3 baseline characteristics associated with lower risk: (1) a history of heart failure (HF), (2) care in a facility with an observation unit, and (3) follow-up within 1 week either in person or phone/email. Nearly 80% of this cohort had HF at baseline; discharging a newly diagnosed patient with HF (de novo HF) may be risky. New onset HF patients may have potentially correctable precipitants or pathogeneses that if missed, portend a significantly worse outcome. Reduced risk associated with care in a facility with an observation unit may be a spurious finding; one other possibility is that patients were actually cared for in the ED and then the observation unit before discharge, resulting in greater management time than a usual ED stay—these patients were lumped together. However, the overall proportion of patients seen in such facilities was low. Close follow-up was associated with less risk—not only for the composite outcome but also for each component—supporting the established recommendation of close follow-up.

Examining the predictors associated with outcomes confirms the classic teaching to prioritize vital signs and abnormal tests: Sending patients home with abnormal vital signs or laboratory work is strongly associated with death and hospitalization although the associated risk is stronger for death than rehospitalization. Interestingly, higher Laboratory-based Acute Physiology Score 2 and abnormal vital signs were not associated with ED revisits. A median income <35 000 was associated with ED revisits but not death or rehospitalization. This confirms past observations of the disproportionate burden of AHF for those of lower socioeconomic status.¹³ Although there is overlap, the factors associated with mortality are distinct from those associated with ED revisits and rehospitalization. This suggests that

unique strategies, working in tandem, will be needed to address these distinct factors.

AT LAST!

Overall, the authors shed light on the outcomes of patients with AHF discharged from the ED in the United States; key data missing from the literature. The robust, well-characterized patients, as well as facility-level and follow-up data, strengthen these findings. The data illuminate the need for a risk-stratification instrument for the ED setting that would allow providers to make accurate decisions based on physiological scores, vitals, and laboratory markers when deciding to discharge or hospitalize a patient with AHF.

The fact that the data come from within an integrated health system adds an interesting twist to the generalizability of these findings. Only patients who had insurance, including pharmacy coverage, were included. Despite insurance coverage and access to primary care, baseline guideline-directed medical therapy seems low, with ≈50% on angiotensin converting enzyme inhibitor, 65% on beta blocker, and 6% on mineralocorticoid receptor antagonist. To be fair, no breakdown on ejection fraction is provided, which may account for some or all of these findings. The ED treatment of AHF is also worth noting—only 37% of patients received a loop diuretic and 6% a nitrate despite a mean systolic blood pressure of 136 mmHg and B-type natriuretic peptide of 664 pg/mL. Finally, within an integrated health system, the fact that patients can readily access primary care may favor ED discharge and close follow-up more readily. The extent to which this contributed to the decision to discharge is unknown. It seems likely that health systems would have worse outcomes without such a robust system of follow-up and pharmacy benefits.^{3,6}

WHERE DO WE GO FROM HERE?

Based on these data, it would be premature to tell emergency physicians they should discharge more patients with AHF. The data are reassuring however; the risk of mortality is low, especially within 7 days. A validated risk rule combined with follow-up within 7 days might fundamentally alter ED AHF management away from near universal admission toward a higher proportion of patients discharged with follow-up. Below are some suggested areas for future work; although far from exhaustive, we also outline some innovative but less commonly discussed topics.

Risk Stratification

It is easy to say more work is needed; it is striking to compare the literature examining risk stratification of chest

patients to that in AHF. Multiple risk assessment rules exist for chest pain, as well as accelerated diagnostic protocols, novel and tested imaging modalities, and biomarkers. As mentioned, several HF risk instruments show promise^{8,9,14}; however, further prospective validation is needed, especially in US patients. Perhaps, the Sax et al¹² data combined with promising risk instruments provide sufficient reassurance to spur further efforts.

Observation Units

Obtaining outcome data to actually test potential risk instruments on discharged ED patients is challenging given the current high admission rate. Observation units present an intermediate step, allowing for more time to evaluate response to therapy, as well as arrange postdischarge follow-up.^{5,6} One form of an observation unit, chest pain decision units, successfully reduce unnecessary testing and hospitalization in lower risk patients with chest pain. Retrospective cohort studies support the use of observation units for HF¹⁵; what is missing is a randomized controlled trial. An Agency for Healthcare Research and Quality–funded randomized controlled trial is about to begin.¹⁶ If a lower risk AHF cohort can be confidently identified in the observation setting, the next step of sending patients directly home may be easier. Concerns that hospitals have gamed the system using observation seem unfounded.¹⁷

Seven Days of Responsibility: My Risk or Patient Risk?

As Sax et al¹² highlight,¹² 7 days seem to be a magical number after which emergency physicians tend to wash their hands of risk. This is not to suggest we do not care what happens to patients later¹¹; only that 7 days seems to be the generally accepted time in which responsibility shifts. An intriguing concept! To be provocative, are risk instruments being developed for patients or physicians? Perhaps to advance the field, it is time to critically examine owning or sharing risk longer. The knee-jerk reaction would be more hospitalizations. But is this cycle of wash-rinse-repeat best patient care or simply a way to mitigate my risk as an emergency physician? If we examine such a practice outside of today's lens of fear—fear of litigation and scope of practice and overwhelming volume of patients—perhaps we would design emergency care delivery differently to optimize acute care of chronic diseases. The reality hurdles are enormous; but the alternative is to keep doing the same thing over and over again.

CONCLUSIONS

With this study by Sax et al,¹² we finally have better insight into the outcomes of patients with AHF dis-

charged from the ED in the United States. Fears of a dreadfully high adverse event rate are unfounded although the risk is still too high to propose studies of immediate discharge. However, the relatively low postdischarge event rate in this study suggests that the finish line is in sight! If better risk stratification and close follow-up are the major hurdles that remain, do we consider these insurmountable? By no means is the work ahead easy; a strong force will be needed to oppose admission inertia but will be well worth the effort.

DISCLOSURES

In the past 2 years, Dr Pang is or has been a consultant for BMS, Novartis, Trevena, Roche Diagnostics, scPharmaceuticals, and has received research or other support from Roche, Novartis, Patient Centered Outcomes Research Institute, American Heart Association, National Heart, Lung, and Blood Institute, and the Agency for Healthcare Research and Quality. The other author reports no conflicts.

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FOOTNOTES

Circ Heart Fail is available at <http://circheartfailure.ahajournals.org>.

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