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Risk Stratification in Older Patients With Acute Myocardial Infarction: Physicians' Perspectives

Shelli L. Feder, MSN¹, Dena Schulman-Green, PhD¹, John A. Dodson, MD², Mary Geda, MSN³, Kathleen Williams, RN, MBA³, Michael G. Nanna, MD⁴, Heather G. Allore, PhD³, Terrence E. Murphy, PhD³, Mary E. Tinetti, MD³, Thomas M. Gill, MD³, and Sarwat I. Chaudhry, MD³

¹Yale University School of Nursing, Orange, CT, USA

²New York University School of Medicine, New York City, USA

³Yale University School of Medicine, New Haven, CT, USA

⁴Yale–New Haven Hospital, New Haven, CT, USA

Abstract

Objective—Risk stratification models support clinical decision making in acute myocardial infarction (AMI) care. Existing models were developed using data from younger populations, potentially limiting accuracy and relevance in older adults. We describe physician-perceived risk factors, views of existing models, and preferences for future model development in older adults.

Method—Qualitative study using semi-structured telephone interviews and the constant comparative method.

Results—Twenty-two physicians from 14 institutions completed the interviews. Median age was 37, and median years of clinical experience was 11.5. Perceived predictors included cardiovascular, comorbid, functional, and social risk factors. Physicians viewed models as easy to use, yet neither inclusive of risk factors nor predictive of non-mortality outcomes germane to clinical decision making in older adults. Ideal models included multidimensional risk domains and operational requirements.

Discussion—Physicians reported limitations of available risk models when applied to older adults with AMI. New models are needed to guide AMI treatment in this population.

Keywords

acute myocardial infarction; older adult; risk stratification models; qualitative methodology; medical decision making

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Corresponding Author: Shelli L. Feder, Yale School of Nursing, Yale University West Campus, P.O. Box 27399, West Haven, CT 06516-7399, USA. ; Email: shelli.feder@yale.edu

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Introduction

Risk stratification models can facilitate acute myocardial infarction (AMI) care by supporting medical decision making. For instance, patients with higher risk for adverse outcomes may warrant more intensive monitoring and treatment. However, existing AMI risk models have limitations when applied to older adults. Adults above 75 years of age have traditionally been underrepresented in AMI studies developing risk stratification models (Dodd, Saczynski, Zhao, Goldberg, & Gurwitz, 2011; Rathore, Weinfurt, Foody, & Krumholz, 2005). These risk models were derived and validated using data from younger populations, potentially limiting their predictive accuracy and relevance in older adults with AMI (Dodd, Saczynski, Zhao, Goldberg, & Gurwitz, 2011; Rathore, Weinfurt, Foody, & Krumholz, 2005). Furthermore, because most AMI risk models were originally restricted to the prediction of mortality risk, these models do not account for outcomes potentially more meaningful and patient centered to older adults, including measures of health status decline and quality of life (Antman et al., 2000; Fox et al., 2006; Halkin et al., 2005).

Despite these limitations, it is unclear how end users, such as physicians, view and use risk stratification models in the care of older adults with AMI. The American College of Cardiology (ACC) and the American Heart Association (AHA) recommend use of AMI risk models as part of routine AMI care (Amsterdam et al., 2014; O'Gara et al., 2013). Physicians' perceptions of risk stratification models are important, as these perceptions may enhance or prevent adoption of models in routine clinical practice. Given the anticipated growth in the number of older adults with AMI, their medical complexity, and risk for poor outcomes, there is a critical need to better understand physicians' views, experiences, and practices surrounding risk stratification in this population (Amsterdam et al., 2014; Gharacholou et al., 2011; O'Gara et al., 2013).

Therefore, the purpose of this study was to describe physicians' perceptions of risk factors for adverse clinical events following AMI in older adults, physicians' views about existing AMI risk stratification models, and their preferences for future risk stratification models for use in older adults with AMI. This work can inform the development of new risk stratification models in the growing population of older AMI patients.

Method

Study Design

The study was conducted as part of the "Comprehensive Evaluation of Risk Factors in Older Patients With AMI" (SILVER-AMI, R01HL115295), an ongoing, multicenter, observational study designed to develop and validate risk stratification models for adults above the age of 75 with AMI. The Yale University Institutional Review Board approved all study policies and procedures.

Sampling

The sampling frame consisted of hospitalist and cardiology physicians. We purposively sampled these groups as they frequently care for older adults hospitalized with AMI throughout the hospital admission. Utilizing a snowball technique, we emailed study site

investigators and non-study associates and asked for referrals of hospitalist or cardiology physicians with experience caring for large numbers of older adults with AMI. We then sent all contacts a mass e-mail soliciting responses from those with experience caring for older adults with AMI and interest in completing a research telephone interview. All cardiology or hospitalist physician respondents who replied to the mass e-mail were invited to participate in the study. Physicians were not required to have prior knowledge of risk stratification models to participate. Physicians were also encouraged to refer other physicians with experience caring for older adults with AMI.

Interview Procedures

Two registered nurses experienced in qualitative interviewing conducted the semi-structured telephone interviews. After consenting participants, the nurses collected demographic and practice data and followed a script of interview questions with probes based on participant responses (Table 1). Interview topics included perceived risk factors for adverse clinical events following AMI, use, strengths, and limitations of existing AMI risk models, and perceived components of an ideal risk model for use in older adults with AMI. We audio-recorded all telephone interviews, which a professional medical transcription service transcribed verbatim.

Data analysis—We used ATLAS.ti 7 qualitative software (Scientific Software, Berlin, Germany) for data coding and analysis. We used the constant comparative method of data analysis, comparing coded units to each other within and across coding categories over successive interviews (Birks & Mills, 2011). Two investigators (S.L.F. and D.S-G.) trained in qualitative methods performed line-by-line review of the transcripts first independently and then jointly, identifying main coding categories and revising the code list as new codes and categories emerged from the data. We resolved all coding discrepancies by group agreement with a third coder (S.C). We continued the analytic process iteratively until no new concepts emerged and data saturation was reached, resulting in the final code list. We kept memos to document the analytic process.

We then applied the final code list to all transcripts and created and analyzed data reports, extracting commonly occurring, overarching themes from the data. Finally, the research group discussed and refined the final themes that emerged. We triangulated data by routinely examining research findings with the research team and with physicians with expertise in gerontology and cardiology.

Results

Sample

Sample demographics are summarized in Table 2. Physicians ($n = 22$) from 14 different clinical sites (not included in the table) completed interviews ranging in length from 10 to 30 min with a mean of 18 min. The sample was 68% male, with a median age of 37 years. Respondents reported a median of 11.5 years of experience after medical school, with 50% of the sample working more than 40 hours a week in direct patient care. The sample

consisted of 77% cardiologists and 23% hospitalist physicians. Forty-six percent of study physicians were from the northeast region of the United States (not depicted in the table).

Perceived Predictors of Risk in Older Adults Following AMI

Physicians were asked what they thought drove risk of adverse events following AMI in older adults. These risk predictors are categorized into cardiovascular status, comorbid conditions, functional measures, and social factors (Table 3).

Cardiovascular status—Cardiovascular status pertained to AMI presentation and treatment. Examples of physician-perceived cardiovascular risk factors included the number and severity of symptoms both prior to admission and during hospitalization, the development of heart failure during hospitalization, hospital procedures including percutaneous angioplasty and coronary artery bypass grafting, and laboratory results such as cardiac enzymes.

Comorbid conditions—Physicians viewed risk in older adults with AMI as considerably influenced by the number and severity of patient comorbidities, and in part, the degree to which comorbidities remained stable or worsened during AMI hospitalization. Physicians described several comorbid conditions perceived to elevate risk in older adults with AMI, including hypertension, diabetes, renal dysfunction (both acute and chronic kidney disease), and chronic obstructive pulmonary disease.

Functional measures and social factors—Physicians cited several functional measures that they perceived as elevating risk in older adults with AMI. For example, physicians viewed mobility of the older adult, before and after the AMI, as a key risk factor. In addition, physicians viewed social support, conceptualized as social networks composed of family and friends able to assist with care, as an important component of risk assessment.

Use, Strengths, and Limitations of Available Risk Stratification Models

Physicians were asked to describe the use, strengths, and limitations of available risk models. Table 4 depicts physicians' views of available models accompanied by illustrative quotes.

Use—A common theme that emerged from physician interviews was related to physicians' reliance on implicit assessments in lieu of objective measures of risk. That is, physicians described relying more on clinical intuition gained from medical practice in guiding AMI care, and less on explicit risk stratification and risk stratification models. Some physicians reported trusting implicit risk assessments to guide AMI medical care in older populations because of perceived limitations and missing risk factors in available risk models, while others reported using risk models as adjunct tools to implicit assessments.

Strengths—Study physicians often viewed available risk models as helpful adjuncts and as alternatives to relying on clinical suspicion and implicit assessment alone. They also viewed risk models as useful in identifying seemingly low-risk patients who, after model application, were actually deemed at higher risk for adverse clinical events. In addition,

study physicians viewed most models as easy to use and readily accessible on a number of technological platforms, both significant strengths. Three commonly reported aspects of model ease of use included short completion time, limited number of required data points to enter, and automated risk calculations.

Limitations—Study physicians also cited several limitations of available risk models when applied to older adults with AMI. These included a perception that models were limited in use for modern-day AMI medical care, that they lacked geriatric-specific risk factors, and that they failed to predict outcomes important to older adults. Physicians viewed existing risk models as limited in use for modern-day AMI medical for several reasons. For example, some physicians felt that the management of AMI had evolved since the development of several of the models. Physicians perceived these changes to AMI medical care as reducing the overall utility of available models. In addition, other physicians felt that the usefulness of risk models in guiding clinical care had been overshadowed by the development of clinical guidelines, such as those put forth by the ACC and AHA (Amsterdam et al., 2014; O'Gara et al., 2013). Physicians viewed clinical guidelines as directing AMI care across all patient populations, regardless of individual patient risk. This in turn, reduced the relevance of risk models to inform individualized treatment decisions in older adults. Finally, physicians viewed risk model results as disconnected from decision making and selection of AMI therapies, and thus limited in guiding medical management beyond risk assessment.

Study physicians felt that existing AMI models lacked risk factors especially informative for older patients and failed to predict non-mortality outcomes essential for determining risk in older adults with AMI. Missing risk factors thought to be relevant included measures of functional status, frailty, and social support. Physicians also perceived several available models as unable to predict outcomes viewed as important to older adults, including disability, long-term mortality, and quality of life. Physicians often viewed these outcomes as patient centered, with significant relevance to the patient and to AMI medical care.

Ideal Risk Stratification Model Components for Older Adults With AMI

Physicians were asked to describe components of an ideal risk model for use in older adults with AMI. Table 5 depicts these components categorized by multidimensional domains and operational requirements.

Multidimensional domains—Components of an ideal risk stratification model for use in older adults with AMI included cardiovascular, functional, and social factors. Physicians perceived cardiovascular risk factors as traditional items commonly found in available risk stratification models, such as the development of heart failure during hospitalization and laboratory values, including cardiac enzymes. Functional risk factors encompassed objective and subjective measures of function such as gait speed, stair climbing ability, and the patient's level of independence both prior to and after the AMI. Social risk factors included items such as social support, discharge disposition (e.g., home, home with services, nursing home), financial resources, and medical literacy both of the individual and of close social networks.

Operational requirements—Operational requirements of an ideal risk stratification model included short completion time, accessibility, and multiplatform interface. Physicians noted that any risk model, for it to be used, should require very little time to complete, all estimations of which were less than 2 to 3 minutes. The model also had to be easily accessible, with options such as online calculators and model availability on multiple devices, including computers, smartphones, or tablets. Finally, physicians viewed the interface of the model as an essential component of model use. Interface included the ability of the model to collect data from within a health care system. An example of interface is the embedding of the model within an electronic health record (EHR), giving the model the ability to automatically collect data from patient records.

Discussion

While physicians reported using risk stratification models for older adults with AMI, many perceived existing models as having important limitations when applied to this population. For example, physicians in our study believed that available risk models lacked geriatric measures important for stratifying risk of adverse events in older adults with AMI, including frailty and functional status. In addition, physicians cited the need for risk stratification tools that went beyond short-term mortality to predict outcomes such as disability and quality of life.

To our knowledge, this is the first study to describe physicians' perceptions of AMI risk stratification models for use in older adults with AMI. The use of AMI risk stratification models, as a means of explicit assessment of risk for adverse clinical events, is recommended by national guidelines (Amsterdam et al., 2014; O'Gara et al., 2013). However, many physicians in our study perceived risk models as adjuncts to clinical suspicion and as supplements to previous medical experience. Physicians often felt that available risk models were of limited clinical utility for clinical decision making about long-term therapies (i.e., secondary prevention). This perception was in part shaped by physicians' views of national AMI guidelines as more relevant in directing AMI medical care than individualized risk assessments.

It is notable that physicians viewed AMI national guidelines as independent of individual patient risk, which in turn reduced the perceived value of risk models for informing treatment decisions. While national guidelines exist to guide AMI management, many guidelines are inflexible, assuming fixed risk across entire populations (Boyd et al., 2005; Shaneyfelt & Centor, 2009). Previous work has found that guidelines often fail to address the unique vulnerabilities of older patients who may have multiple comorbidities, potentially leading to significant treatment burden, polypharmacy, and other complications (Boyd et al., 2005; Hughes, McMurdo, & Guthrie, 2013). Thus, physicians who rely primarily on clinical management guidelines may miss nuances in risk analysis for both short- and long-term outcomes. This may lead to potentially deleterious implications for older patients.

Many physicians identified geriatric measures as important drivers of risk in older patients with AMI. There is emerging evidence supporting the role of geriatric measures, such as frailty, impediments of function, and lack of social support, as risk factors in predicting

outcomes in older adults following AMI (Huerre et al., 2010; Leifheit-Limson et al., 2012; Purser et al., 2006). Measures of frailty, such as grip strength and gait speed, have been associated with mortality following AMI (Ekerstad et al., 2014; Matsuzawa et al., 2013; Purser et al., 2006; Sasaki, Kasagi, Yamada, & Fujita, 2007; Singh et al., 2011; Studenski et al., 2011). Poor social support affects post-AMI outcomes, including symptom burden, quality of life, and poor adherence to post-AMI medical therapies (Leifheit-Limson et al., 2012; Leifheit-Limson et al., 2012). However, several of these studies have important limitations, including recruitment from single health care institutions and relatively small sample sizes (Ekerstad et al., 2014; Huerre et al., 2010; Matsuzawa et al., 2013; Purser et al., 2006). Conclusive evidence about the prognostic importance of geriatric measures in AMI patients is still notably lacking.

There are several limitations to consider in the interpretation of this study. Referent to quantitative studies, our sample size may appear prohibitively small; however in qualitative work this sample size is appropriate when data saturation is reached (Birks & Mills, 2011). In addition, our respondents came from a variety of health care institutions, 14 independent institutions total. Nevertheless, our findings are not representative of all physicians, practice settings, or institutional cultures. In addition, our study physicians were generally younger, meaning the sample skewed toward those with fewer years of clinical experience after medical school. However, those with less clinical experience may be less likely to rely on years of clinical experience and more so on measures of objective assessment such as risk stratification models. Therefore, our younger sample may represent the population more likely to use risk stratification models in clinical practice and can therefore speak to their perceptions and preferences of model use for older adults with AMI. Finally, our study did not include in the sample non-physician clinicians such as nurse practitioners or physician associates who may have contributed insights into the use of risk stratification models for older adults from their perspectives.

Our results also highlight several areas for future research. Our findings may warrant the inclusion of geriatric measures, such as measures of frailty and functional status, into new model development for older adults with AMI. Physicians viewed ease of use and model accessibility as essential components of an ideal risk model. Researchers will need to identify ways to better integrate technological advances, such as the integration of models into EHRs, into risk model development. Future research should evaluate a wider spectrum of clinicians' perceptions of risk model use and risk stratification in older adults with AMI. Finally, older adults with multiple comorbid conditions are complex and are at risk for multiple adverse outcomes following AMI beyond 30-day mortality, such as long-term mortality, hospital readmission, and health status decline. The risk factors for each of these outcomes are likely to differ. As a result, risk model development for this population will likely need to account for multiple patient risk factors and outcomes. Researchers will need to weigh model accessibility and ease of use alongside clinicians' desires for models that include complex risk factors that comprehensively quantify risk for a range of outcomes.

Conclusion

Physicians identified several strengths and limitations of available risk stratification models for use in older adults with AMI. Physicians viewed measures of functional status and social support as important risk factors in this population, and therefore important omissions of available risk models. Physicians also desired models that predicted outcomes beyond short-term mortality. These findings underscore the need for additional evaluation of pertinent risk factors and patient-centered outcomes for older adults with AMI. This work can inform the development of new AMI risk stratification models that can more thoroughly and accurately assess risk and guide treatment in this population.

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Table 1

Examples of Interview Questions and Probes.

Question	Probe
What patient characteristics do you think can be used to predict risk of poor outcomes such as hospital readmission, mortality, or health status decline, in older adults with AMI?	Of these, are there some that are more important in predicting risk in older adults with AMI?
Which models do you use for risk stratification in older patients with AMI?	What do you like/dislike about this model? What are the theoretical or practical strengths or limitations of the model? If you do not use risk models—Why? How do you use these risk stratification models in this population?
If you could design your own risk model for older adults with AMI what factors would you consider?	Of these factors, are there some that you think are more important?

Note. AMI = acute myocardial infarction.

Table 2Characteristics of Study Participants ($n = 22$).

Characteristic	Median (range)
Age, years	37 (32-62)
Years of clinical experience after medical school	11.5 (5-36)
	<i>N</i> (%)
Male	15 (68.2)
White race	16 (72.7)
Hours per week spent in clinical practice	
<20	5 (22.7)
20-40	6 (27.3)
>40	11 (50)
Practice location	
Urban	17 (77.3)
Suburban	4 (18.2)
Urban and suburban	1 (4.5)
Practice setting	
Academic medical center	19 (86.4)
Clinical specialty	
Cardiology	17 (77.3)
Hospitalist	5 (22.7)

Table 3

Physicians' Perceived Predictors of Risk in Older Adults Following AMI.

Risk factor	Exemplars
Cardiovascular status	Severity of AMI
	Development of heart failure during hospitalization
	Symptoms
	Cardiac enzymes
	Brain natriuretic peptide
	Hospital procedures
	Complicated hospital stay
Comorbidities	Hypertension
	Diabetes
	Renal dysfunction
	Chronic obstructive pulmonary disease
	Cognitive impairments
	Change in comorbidity status after AMI
Functional measures and social factors	Discharge disposition (e.g., nursing home vs. home)
	Level of functional independence prior to admission
	Mobility
	Ability to follow up with providers
	Social support

Note. AMI = acute myocardial infarction.

Table 4

Physician-Reported Strengths and Limitations of Available Risk Stratification Models for Older Adults With AMI.

Theme	Illustrative quote
Strengths	
Adjuncts to help inform clinical decision making	<p>"I use them very much as adjuncts to clinical suspicion."</p> <p>"It's a helpful thing, more to sometimes maybe raise my suspicion about things."</p>
Identifies seemingly low-risk patients who may need more aggressive therapy	<p>"[It] would tip me over the edge of wanting to give more than just aspirin or just aspirin and heparin."</p> <p>"Helpful in identifying people who on first blush don't look like they may need to have a more aggressive antiplatelet sort of regimen and that kind of thing earlier on."</p> <p>"I think [the model] is helpful somewhat to identify people who might actually be at higher risk for mortality in certainly the short term."</p>
Model accessibility and ease of use	<p>"I like that they're easy to use. You don't have to sit down and memorize all of the risk factors. It's an easy interface."</p> <p>"Don't require fractions and powers of 10 to calculate accurately."</p>
Limitations	
Limited in use in modern-day AMI care	<p>"I often think the scores may be a little bit anachronistic, and our reperfusion strategy has changed a little bit."</p> <p>"I think the risk models, they may predict the likelihood of recurrent events but regardless of that, the current clinical guidelines are not dependent on their scores."</p> <p>"I'm not sure the tools we have are fine-tuned enough that that's meaningful either to me clinically or to communicate to a patient or family."</p>
Lack of geriatric risk factors	<p>"I think there are certain specific characteristics about older people that are not really captured."</p> <p>"I find them incomplete in more subjective things like frailty."</p> <p>"Their [older adults] functional status and their ability to live independently and their ability to ambulate independently, I think, are more important predictors. I don't have a way of sort of quantifying that into telling me how I should treat those patients. I sort of use that implicitly in my judgment."</p>
Lack of geriatric outcomes	<p>"None of these things have been tested in the older AMI patients. Yet these are the people I'm sitting in front of."</p> <p>"Long-term prognostic issues, they probably fall short because they don't look at the functional and societal factors."</p> <p>"The [model] really focuses on mortality, and I think in the geriatric population mortality is important, but quality of life is equally important."</p>

Note. AMI = acute myocardial infarction.

Table 5

Ideal Components of a Risk Stratification Model for Older Adults With AMI.

Component	Exemplars
Multidimensional domains	
Traditional cardiovascular risk factors	Development of heart failure during hospitalization Comorbidities Lab values (e.g., renal function, cardiac enzymes) Diagnostic measures (e.g., ejection fraction)
Functional measures	Gait speed Stair-climbing Level of independence prior to admission
Social factors	Social support Medical literacy Discharge disposition Financial resources
Operational requirements	
Completion time	Less than 2 to 3 min Easy to complete—Few data points Limited required mathematical computations
Accessibility	Availability on smartphone or tablet Online calculator Easily found using common search engines
Interface	Embedded within an electronic medical record Computer networks (e.g., Intranet)

Note. AMI = acute myocardial infarction.