Technical Appendix 2. A Strategy To Develop Practical, Dynamic Prognostication Models.

A primary goal of any predictive model, including ours, is to quantify risk for individual patients, so as to stratify them into low-, intermediate-, or high-risk categories. Such quantitative estimates of 30-day mortality at the end of Days 0, 2, 4, and 6 can be calculated quickly using a programmable calculator or computer. For instance, the probability of 30-day mortality at baseline at day 0, P0-30, is:

$$1/[1+ \exp \{-PI0\text{-}30\}],$$

where PI0-30 = *age + * diabetes + * previous MI + * no previous PCI + * systolic blood pressure + * heart rate + * ST depression + * rales + * peripheral vascular disease + * prior aspirin use + * prior beta-blocker use + * prior calcium channel blocker use + MI on enrollment.

The risk of death can be readily estimated by entering patient data corresponding to the 13 variables in the above formula, e.g., 77, 1, 0, 1, 122, 84, 2, 1, 0, 1, 1, 0, 1. Then a calculator or computer will provide an estimate of the risk of 30-day mortality, based on the formula above. Similarly, the Day 3-30, 5-30, 7-30, and over-time models easily can be built into the calculator or computer to generate probability estimates for individual patients.

Simplified risk scores can be generated from our models for ease of use by clinicians without resorting to a calculator or computer. Based on our Day 0-30 model, for instance, we could simplify the list of predictive variables and assign an integer factor score to each as follows:

Variable	Factor Score
Age (years)	
65-74	1
75+	2
Risk factors ≥2	1
Prior medications ≥2	1
Systolic blood pressure <110 mm Hg	1
Heart rate >85 bpm	1
ST depression ≥2 mm or confounders	1
MI on enrollment	1
Rales	1
Total Possible Score	**10**

In the above model, we would assign a score of 1 if a patient had at least 2 of the following risk factors: diabetes, previous MI, no previous PCI, peripheral vascular disease, or rales. Similarly, we would assign a score of 1 if the patient had previously used at least 2 of the following medications: aspirin, β-blockers, or calcium-channel blockers. This simplified model has a C-

index value of 0.79, which is only marginally lower than the 0.80 value of our full Day 0-30 model. Obviously, simplified models with simple factor scores also can be developed for Days 3-30, 5-30, and 7-30.

Our preference, however, is to use the full models to estimate the risk for individual patients rather than relying on simplified models. This is because it is extremely difficult, if possible at all, to develop a system of simplified scores that are consistent across all models: it is easy to develop simplified scores for separate models, but the risk associated with each score, say, a score of 5, tends to differ in the Day 0-30 model compared with the Day 3-30 or Day 5-30 models. Of greater concern, however, is the spread of risk associated with each simplified score. This is illustrated in the figure below, which presents a box plot of the predicted probabilities of 0- to 30-day mortality from the full Day 0-30 model for each of the risk scores derived from the simplified model. There is a nice gradient of increased median risk associated with the simplified scores, but the spreads of risks as estimated by the full model are wide and overlap with the simplified scores. Thus, the simplified scores appear to work well on average, but they may not work as well for individuals. To minimize the likelihood of misclassifying individuals by risk, the use of full models with appropriate computing technology seems to be a preferred strategy.

Figure. Box Plot of Predicted 0- to 30-day Mortality (from full model), by Simplified Risk Score