CHAPTER IV

RESULTS

Basic characteristic of patients and baseline data

During the study period, there were 708 admissions to the ICU. After the exclusion of 27 patients with missing data, 16 re-admissions, and 13 patients with a length of stay in the ICU of less than 24 h, and 13 patients younger than 18 years, 639 patients remained (90.2%). As table 3.1 shows, most patients were males (57.6%), with a mean (SD) age of 56.9 (20.6) years. There was a clear predominance of surgical patients (67.9%). Non-scheduled surgery was the principal category of admission, accounting for 40.5% of the patients.

The overall mortality in the ICU was 25.7 % and the corresponding mortality in the hospital 34.1%. Median length of stay in the ICU was 3 days (inter-quartile range, 1-7 days). Overall mean prediction of death were high (SAPS II 41.4 $\pm$ 31.6, MPM$_{24}$ II 38.5 $\pm$ 29.8).

Table 3.1:   Basic demographic data

	n = 639
Male sex	368 (57.6%)
Age in years	
mean, SD	56.9 (20.6)
min-max	18 - 100
Type of admission	
Unscheduled surgery	259 (40.5%)
Medical	205 (32.1%)
Scheduled surgery	175 (27.4%)
Length of stay (days)	
mean, SD	6.3 (8.6)
min – max	1 – 49
median	3
interquartile range	1 - 7
ICU mortality	164 (25.7%)
Hospital mortality	218 (34.1%)
SAPS II score (mean, SD)	47.9 (17.9)
SAPS II prediction of death (mean, SD)	41.4 (31.6)
$MPM_{24}II$ prediction of death (mean, SD)	38.5 (29.8)

Predicted mortalities

Table 3.2 shows actual and predicted hospital mortality for each scoring system, and also standardized mortality ratio (SMR) and their 95% confidence intervals. Both SAPS II and MPM_{24} II overestimated the observed mortality (SMR < 1). There was no significant difference between the SMR for MPM_{24} II and 1, as evident from the confidence intervals; this indicate that the scoring system gave overall accurate mortalities estimates.

Table 3.2:   Mortalities predicted by SAPS II and MPM_{24} II and standardized mortality ratio (SMR)

System	n	observed mortality	Predicted mortality	SMR (95% CI)
SAPS II	639	0.34	0.41	0.83 (0.74 – 0.92)
MPM_{24} II	639	0.34	0.38	0.89 (0.78 – 1.01)

Discrimination

The results of the 2 × 2 classification tables for SAPS II and MPM_{24} II are shown in Table 3.3. The accuracy or overall correct classification rate was higher for MPM_{24} II than for SAPS II at the different cutoff points. This was consistent with the results of ROC curves testing.

Table 3.3:   2 X 2 classification table at the predicted mortality of SAPS II and MPM_{24} II

SAPS II Predicted mortality	Sensitivity (%)	Specificity (%)	Accuracy (%)	Positive predictive Value (%)	Negative predictive Value (%)	Positive Likelihood Ratio
0.1	94.0	54.9	68.2	51.9	54.9	2.1
0.2	88.1	72.7	77.9	62.5	72.7	3.2
0.3	80.7	80.5	80.6	68.2	80.5	4.1
0.4	73.9	84.1	80.6	70.6	84.1	4.6
0.5	71.1	89.8	83.4	78.2	89.8	7.0
0.6	67.0	92.6	83.9	82.5	92.6	9.1
0.7	59.6	95.5	83.3	87.2	95.5	13.2
0.8	44.0	97.1	79.0	88.9	97.1	15.2
0.9	27.8	99.5	68.2	89.5	99.5	55.6

| MPM_{24} II Predicted mortality	Sensitivity (%)	Specificity (%)	Accuracy (%)	Positive predictive Value (%)	Negative predictive Value (%)	Positive Likelihood Ratio
0.1	94.5	62.2	73.2	56.4	62.2	2.5
0.2	88.5	75.8	80.1	65.4	75.8	3.6
0.3	83.5	81.0	81.8	69.5	81.0	4.4
0.4	79.8	86.2	84.0	75.0	86.2	5.8
0.5	77.1	90.5	85.9	80.8	90.5	8.1
0.6	72.5	93.6	86.4	85.4	93.6	11.3
0.7	62.4	95.5	84.2	87.7	95.5	13.9
0.8	53.7	97.1	82.3	90.7	97.1	18.5
0.9	23.4	99.3	73.4	94.4	99.3	33.4

To estimate the discriminative power of the scoring systems, the area under the ROC curve was used. The values were 0.88 for SAPS II, and 0.91 for MPM $_{24}$ II (Table 3.4). When the area under the ROC curve were compared, a statistic difference (p = 0.007) was found between both scoring systems. This reflects the better discriminative power of MPM$_{24}$ II than SAPS II. In figure 3.1, the ROC curves of the two scoring systems were plotted.

Table 3.4: Area under Receiver Operating Characteristic (ROC) Curves

| System	n	ROC AUC	95 % CI
SAPS II	639	0.88	0.85 – 0.91
MPM$_{24}$ II	639	0.91	0.88 – 0.93

p-value = 0.007

Figure 3.1: Receiver operating characteristic (ROC) curves for SAPS II and MPM $_{24}$ II
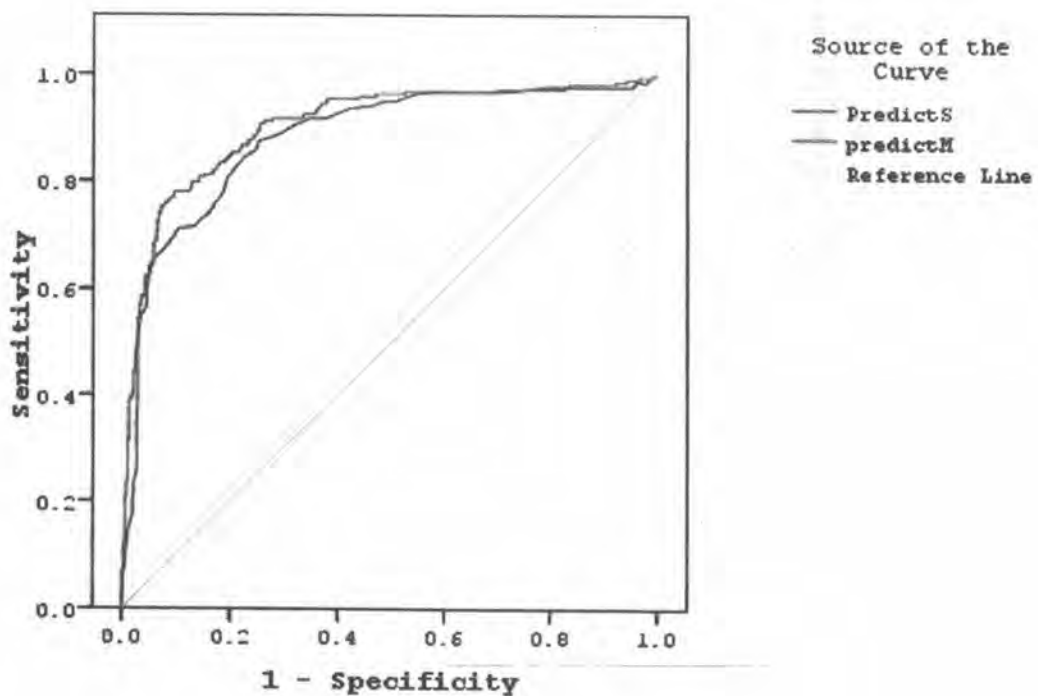
Calibration

Calibration curves were shown in Figure 3.2. Of the two scoring systems, SAPS II stood out as deviating from the identity line more than MPM_{24} II. The SAPS II curve showed an underestimation of mortality in most of the strata, including those with large numbers of patients, leading to the skewed appearance of its calibration. The curve of MPM_{24} II showed an underestimation of mortality in low-risk patients and an overestimation of mortality in high-risk patients.

Figure 3.2: Calibration curves for SAPS II and MPM_{24} II
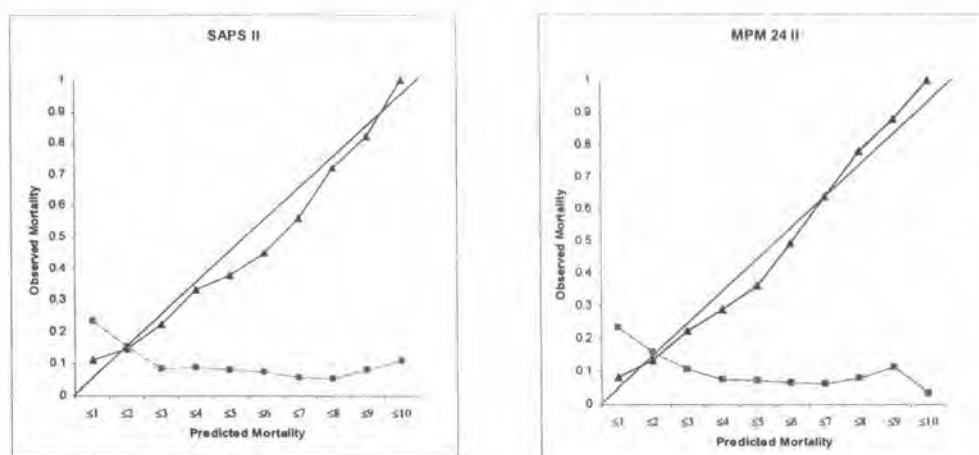
Bold line, observed mortality = predicted mortality; *triangle*, observed mortality, *square*, percentage of patients.

The results of Hosmer-Lemeshow goodness-of-fit tests were shown in Table 3.5. For SAPS II, calibration tested by the statistic was poor. SAPS II has Hosmer-Lemeshow goodness-of-fit tests that are statistically significant ($\chi^2 = 20.65$; p = 0.008). Calibration of MPM_{24} II was good ($\chi^2 = 14.45$; p = 0.070). The chi square value for calibration of MPM_{24} II was not statistically significant suggesting a good calibration of MPM_{24} II.

Table 3.5: The Hosmer-Lemeshow goodness-of-fit test for SAPS II and MPM_{24} II

| | | SAPS II | | | |
| | | survivors | | Non-survivors | |
Decile	n	Observed	Expected	Observed	Expected
1	63	58	60.63	5	2.37
2	59	57	56.25	2	2.75
3	63	63	59.29	0	3.71
4	59	53	54.21	6	4.78
5	65	57	56.36	8	8.64
6	72	51	54.85	21	17.15
7	66	42	38.87	24	27.12
8	59	26	21.09	33	37.91
9	63	3	11.73	60	51.27
10	70	11	7.71	59	62.29

$\chi^2 = 20.65$ p-value = 0.008

| | | MPM_{24} II | | | |
| | | survivors | | Non-survivors | |
Decile	n	Observed	Expected	Observed	Expected
1	64	60	62.16	4	1.84
2	64	62	61.70	2	2.30
3	64	63	61.14	1	2.86
4	65	62	60.64	3	4.36
5	65	57	57.38	8	7.62
6	65	44	49.92	21	15.08
7	64	45	35.22	19	28.78
8	64	16	19.10	48	44.89
9	64	8	8.93	56	55.07
10	60	4	4.81	56	55.19

$\chi^2 = 14.45$ p-value = 0.07