ORIGINAL ARTICLE

Prognostic role of the simplified pulmonary embolism severity index and shock index in pulmonary embolism

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KEY WORDS

long-term mortality, pulmonary embolism, shock index, short-term mortality, simplified pulmonary embolism severity index

ABSTRACT

INTRODUCTION   The stratification of acute pulmonary embolism (PE) using the simplified pulmonary embolism severity index (sPESI) and shock index (SI) does not require any prognostic tools such as biomarkers or echocardiography.

OBJECTIVES   We compared the ability of the sPESI and SI to predict 30-day and 3-year mortality following PE.

PATIENTS AND METHODS   Prognostic models based on the sPESI and SI were used to predict the overall 30-day (short-term) and 3-year (long-term) mortality in a cohort of 194 patients with confirmed PE.

RESULTS   Overall, the mortality rate in this cohort was 9.2% in the first month and 29.9% at 3 years. The sPESI categorized fewer patients as low risk (41.7%; 81 of 194 patients) when compared with the SI lower than 1 (74.7%; 145 of 194 patients). Importantly, patients classified as low risk in the sPESI had no 30-day mortality compared with 2.1% of patients (3 of 145) classified as low-risk based on the SI. The 3-year mortality rate in low-risk patients according to the sPESI was lower than that in low-risk patients identified based on the SI (4.9% vs. 20.7%; $P < 0.0001$). While a multivariate Cox analysis showed that both the SI and sPESI were independent prognostic variables for 3-year mortality, it showed that only the SI was an independent prognostic variable for 30-day mortality.

CONCLUSIONS   Both prognostic models allow to stratify the risk of short- and long-term mortality in patients with PE, but the sPESI was better than SI at classifying low-risk patients.

INTRODUCTION   Acute pulmonary embolism (PE) is related to high in-hospital or 30-day (short-term) mortality rates of 4% and 13%, respectively.[1,2] Recent studies have revealed that PE is associated with an increased risk of long-term adverse events after hospital discharge, with 1-year mortality rates of as high as 25%.[3-5] Early mortality from PE is related to clinical outcomes and the underlying disease.[2] Risk stratification of patients with PE could help identify those at low risk, who can be treated on an outpatient basis, and those at high risk, who might benefit from intensive care and in-hospital thrombolytic treatment.[6] Furthermore, accurate and objective prognostic models might help clinicians assess whether early hospital discharge or outpatient treatment of selected PE patients at low clinical risk is feasible.[7]

Although all prognostic models have limitations in everyday clinical practice, some are recommended for risk stratification of patients with acute PE.[8-11] The pulmonary embolism severity index (PESI) is a widely validated prognostic model for 30-day mortality.[9] The model is based on baseline clinical findings. Studies have demonstrated that this model can identify patients with low mortality risk who may be treated on an outpatient basis.[12,13] The PESI may not be suitable for routine clinical practice in busy emergency or pulmonology departments because the index is based on 11 different parameters, and each

parameter has a categorical value. The simplified PESI (sPESI) is a modified form of the PESI developed by Jimenez et al.[14] The sPESI contains 7 variables instead of 11: age, >80 years; history of chronic cardiopulmonary disease; history of cancer; heart rate, ≥110 bpm; systolic blood pressure, <100 mmHg; and arterial oxyhemoglobin saturation, <90 %. The categorical value of each variable was 1 point. Patients who do not meet any of the above criteria are classified as low-risk, and those fulfilling any of the above criteria, as high-risk. A previous study showed that the sPESI successfully predicts 30-day mortality in patients with PE.[14]

The shock index (SI), defined as the heart rate divided by systolic blood pressure, is an independent prognostic model of 30-day mortality in patients with PE.[15] A multicenter study demonstrated that the SI had high sensitivity in identifying the subgroups of patients at low risk of mortality.[15] In a new approach, this index is used to speed up the triage of patients with suspected acute PE.[16] If the SI is 1 and higher and right ventricular dysfunction (RVD) is present on an echocardiogram in PE patients in poor general condition, early thrombolytic treatment can be administered without imaging studies.[16]

In the majority of studies,[7-9] the sPESI and SI prognostic models have been used to predict 30- or 90-day mortality after acute PE. To the best of our knowledge, only 1 study evaluated the relationship between the sPESI and 6-month mortality.[17]

In the present study, we assessed the accuracy of the sPESI and SI in predicting 30-day and 3-year mortality rates in patients with acute PE. We also assessed the ability of prediction rules to identify low-risk patients with acute PE who might be treated on an outpatient basis.

PATIENTS AND METHODS **Study design** Using the baseline data collected prospectively at the time of PE diagnosis and subsequent data from this cohort, we investigated the ability of the sPESI and SI prognostic models to predict the overall 30-day (short-term) and 3-year (long-term) mortality.

The sPESI for each patient was calculated. Patients were classified as low-risk (0 points) or high-risk (≥1 point) based on the criteria described in the Introduction section.[14] The SI was defined as the heart rate divided by systolic blood pressure. Patients with an SI of 1 or higher were defined as high-risk, while those with an SI of less than 1 were considered low-risk.[15] We also assessed the ability of the prediction rules to identify low-risk patients with acute PE who could be candidates for treatment in the outpatient setting. All patients gave informed consent to participate in the prospective registry in accordance with the requirements of the local ethics committee.

Patients and setting Patients were recruited from the emergency and pulmonology departments of the Turgut Özal Medical Center between January 2008 and March 2011. The diagnosis of PE was confirmed either by contrast-enhanced multislice computer tomographic pulmonary angiography according to the previously described criteria,[18] a high-probability ventilation–perfusion scan result,[19] or lower-limb venous compression ultrasonography positive for proximal deep vein thrombosis in patients with inconclusive ventilation–perfusion scans.[20] Coexisting diseases such as chronic cardiopulmonary disease (eg, congestive heart disease and chronic obstructive pulmonary disease) were diagnosed according to the relevant guidelines.[21,22] In addition, we included patients with previous or active cancer confirmed by a pathological examination.

Study outcomes The primary outcome was all--cause death 30 days and 3 years after the diagnosis of PE. The overall mortality was defined as death from any cause. The data on the overall mortality was obtained from our hospital records and the national death registration system.

Treatment Patients were initially hospitalized and treated with therapeutic doses of parenteral anticoagulants (intravenous unfractionated heparin or weight-adjusted doses of subcutaneous low-molecular-weight heparin [enoxaparin]) and later switched to oral vitamin K antagonists. Thrombolytic treatment was instituted in patients with confirmed PE and hemodynamic impairment as deemed appropriate by an attending physician. After the initial treatment period, clinicians closely monitored the intensity of oral anticoagulant therapy until the international normalized ratio (INR) was stable (2–3). Thereafter, INR was assessed approximately twice a month. Patients in whom anticoagulant therapy was contraindicated had an inferior vena cava filter implanted and anticoagulation discontinued.

Statistical analysis Baseline characteristics are presented as mean ± standard deviation for continuous data and number (percentage) for categorical data. Most continuous variables were dichotomized, and the proportions in each group were described. The χ^2 or Fisher exact test was used to compare categorical data between the groups. Continuous variables were compared with the Kruskal–Wallis test. We calculated the proportion of low-risk vs. high-risk patients based on each prognostic model and determined the overall 30-day and 3-year mortality in both groups. The proportions of the overall mortality between the groups were compared with the χ^2 test, using the Yates correction, Fisher exact test, and the McNemar test. To assess the accuracy of the models, we estimated the sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), positive likelihood ratio (PLR), and negative likelihood ratio (NLR) of each model and those of the combined models. The discriminatory power of each prediction rule was assessed by calculating the area under the receiver

TABLE 1 Characteristics of the study population

Clinical characteristics	All patients (n = 194)	30-day mortality			3-year mortality		
		no (n = 176)	yes (n = 18)	*P* value	no (n = 136)	yes (n = 58)	*P* value
demographic factors							
median age, y	60.8 ±16.7	60.0 ±16.6	68.2 ±15.7	0.049	57.0 ±16.0	69.6 ±14.8	<0.0001
age >80 years	17 (8.8)	15 (8.5)	2 (11.1)	NS	7 (5.1)	10 (17.2)	0.011
male sex	93 (48)	80 (45.5)	13 (72.2)	0.027	64 (47.1)	29 (50.0)	0.023
comorbidities							
chronic lung disease	19 (9.8)	14 (8)	5 (27.8)	0.020	9 (6.6)	10 (17.2)	0.033
congestive heart disease	25 (12.9)	23 (13.1)	2 (11.1)	NS	16 (11.8)	9 (15.5)	NS
cancer	22 (11.3)	20 (11.4)	2 (11.1)	NS	7 (5.1)	15 (25.9)	<0.0001
clinical presentation on admission							
median heart rate, bpm	101.0 ±21.8	98.7 ±21.1	123.4 ±13.8	<0.0001	96.2 ±20.0	112.4 ±21.7	<0.0001
heart rate ≥110 bpm	127 (65.5)	125 (71)	2 (11.1)	<0.0001	102 (75.0)	25 (43.1)	<0.0001
median SBP mmHg	121.6 ±21.6	124.0 ±20.1	97.6 ±21.6	<0.0001	124.9 ±18.7	113.7 ±25.7	0.001
SBP <100 mmHg	32 (16.5)	22 (12.5)	10 (55.6)	<0.0001	15 (11.0)	17 (29.3)	0.003
median saturation	89.4 ±6.2	90.0 ±5.7	83.8 ±8.2	<0.0001	90.7 ±5.3	86.4 ±7. 0	<0.0001
saturation <90%	80 (41.2)	66 (37.5)	14 (77.8)	0.002	41 (30.1)	39 (67. 2)	0.002
respiratory rate, bpm	27.9 ±6.1	27.4 ±5.5	33.1 ±8.7	<0.0001	26.6 ±5.1	31.0 ±7.2	<0.0001
sPESI risk classes							
low-risk	81 (41.8)	81 (46)	0	<0.0001	77 (56.6)	4 (6.9)	<0.0001
high-risk	113 (58.2)	95 (54)	18 (100)	<0.0001	59 (43.4)	54 (93.1)	<0.0001
SI risk classes							
low-risk	145 (74.7)	142 (80.7)	3 (16.7)	<0.0001	115 (84.6)	30 (51.7)	<0.0001
high-risk	49 (25.3)	34 (19.3)	15 (83.3)	<0.0001	21 (15.4)	28 (48.3)	<0.0001

Data are given as mean ± standard deviation or number (percentage); the *P* value was given for survival and deaths.

Abbreviations: NS – nonsignificant, SBP – systolic blood pressure, SI – shock index, sPESI – simplified pulmonary embolism severity index

operating characteristic (ROC) curve (AUC), and the value of the AUC in both predictive models was compared. Then, 95% confidence intervals (CIs) were computed.

A multivariable Cox regression analysis was used to evaluate the usefulness of SI and sPESI risk categories (low-risk vs. high-risk) as predictors of 30-day and 3-year mortality. To estimate survival, the Kaplan–Meier method was applied, and the log-rank test was used to estimate the differences between the groups. A *P* value of less than 0.05 was considered statistically significant. All analyses were conducted with a commercially available statistical software package (SPSS, version 15.0, 2006; SPSS Inc., Chicago, Illinois).

RESULTS During the study period, PE was diagnosed in 204 patients. Of those, 3 (1.5%) refused to participate in the study and 7 (3.4%) were lost in the period between discharge and the end of follow-up. Thus, the final patient sample included 194 patients. Multislice computed tomography pulmonary angiography was the most frequently used technique to confirm acute PE (n = 170, 87.6%). Lung scans were also used (n = 15, 7.7%). Nine patients (4.6%) had a nondiagnostic ventilation–perfusion lung scan and proximal deep venous thrombosis documented by ultrasonography.

The overall mean age of the patients was 60.8 ±16.7 years, and 93 (47.9%) were men. Patients' clinical symptoms, predisposing conditions, and relevant findings at presentation are shown in **TABLE 1**.

Of the 194 patients, 20 (10.3%) had a massive PE, of which 150 patients (77.3%) were treated with low-molecular-weight heparin, 26 (13.4%) received treatment with unfractionated heparin, 17 (8.7%) were treated with thrombolytic therapy, and a vena cava filter was used in 1 patient (0.51%). The duration of anticoagulation was from 3 to 12 months.

As shown in **TABLE 2**, the sPESI classified a significantly lower proportion of patients as low-risk (41.7%) compared with the SI (74.7%) (*P* <0.0001).

Clinical outcomes at 30 days Of the 194 patients, 18 (9.2%) died within the first 30 days after the diagnosis of PE. There were no deaths among low-risk patients classified by the sPESI, while the overall 30-day mortality was 2.1% (3 of 145 patients) in the low-risk group classified by the SI (**TABLE 2**). Patients classified as high-risk using the sPESI had significantly lower mortality (15.9%; 18 of 113 patients) compared with patients according to the SI (30.6%; 15 of 49 patients) (*P* = 0.033). Using the sPESI, for predicting the overall

TABLE 2 Overall 30-day and 3-year mortality based on the simplified pulmonary embolism severity index and shock index

	All patients (n = 194)	30-day mortality (n = 18)	3-year mortality (n = 58)
sPESI			
low-risk (n = 81)	41.7 (34.7–49.0)	0	4.9 (1.5–12.8)
high-risk (n = 113)	58.2 (50.9–65.2)	15. 9 (9.9–24.2)	47.8 (38.3–57.3)
P value	0.0012	<0.0001	<0.0001
SI			
low risk (n = 145)	74.7 (67.9–80.5)	2.1 (0.5–6.4)	20.7(14.6–28.4)
high risk (n = 49)	25.2 (19.4–32.01)	30.6 (18.6–45.5)	57.1 (42.2–70.8)
P value	<0.0001	<0.0001	<0.0001

Data are given as percentage and 95% confidence interval.

Abbreviations: see **TABLE 1**

30-day mortality, survival was lower in the high-risk group compared with the low-risk group (log--rank test, *P* <0.0001; **FIGURE 1A**). Similarly, using the SI for predicting the overall 30-day mortality, survival was significantly lower in the high--risk group compared with the low-risk group (log-rank test, *P* <0.0001; **FIGURE 1B**).

The sensitivity and NPV of the sPESI were higher than those of the SI, and the NLR of the sPESI was lower than that of the SI with regard to predicting 30-day mortality in the study cohort (**TABLE 3**). The discriminatory power of the sPESI in predicting 30-day mortality, expressed as the AUC, was 0.73 (95% confidence interval [CI], 0.64–0.81). The SI also successfully predicted the overall mortality at 30 days (AUC, 0.82; 95% CI, 0.71–0.92).

In the multivariable Cox regression analysis, used to examine the potential role of the sPESI and SI, only the high-risk group according to the SI showed a significant association with 30-day mortality (hazard ratio [HR], 9.43; 95% CI, 2.72–32.61; *P* <0.0001).

Clinical outcomes at 3 years Fifty-eight patients (29.9%) died within 3 years since the diagnosis of PE. For the overall 3-year mortality, low-risk patients according to the sPESI showed significantly lower mortality than low-risk patients identified based on the SI (4.9% vs. 20.7%, *P* <0.0001; **TABLE 2**). On the other hand, 54 of 113 patients (47.8%) with high risk according to the sPESI died over the 3-year period compared with 28 of 49 patients (57.1%) with high-risk according to the SI (**TABLE 2**).

The discriminatory power of the sPESI to predict 3-year mortality, expressed as the AUC, was 0.74 (95% CI, 0.67–0.81). The SI also accurately predicted the overall mortality at 3 years (AUC, 0.66; 95% CI, 0.57–0.75). For predicting 3-year mortality, the AUC value of the sPESI was higher than that of the SI (*P* <0.0001). Therefore, the discriminatory power of the sPESI in predicting 3-year mortality is greater than that of the SI.

In the study cohort, the sensitivity and NPV of the sPESI for predicting the overall 3-year mortality were higher than those of the SI and the NLR was lower (**TABLE 3**). Thus, the sPESI appears much more accurate for excluding 3-year mortality. Combining the 2 models did not seem to improve the prediction of 30-day and 3-year mortality (**TABLE 3**).

In a multivariate Cox regression analysis, the classification of patients based on the sPESI (HR, 10.28; 95% CI, 3.65–28.97; *P* <0.0001) and SI (HR, 2.27; 95% CI, 1.34–3.85; *P* = 0.002) was significantly associated with the 3-year mortality rate.

The Kaplan–Meier curve for cumulative survival of low-risk vs. high-risk patients classified using the sPESI and SI was significant when compared at 3 years (log-rank test, *P* <0.0001; **FIGURE 2**).

DISCUSSION In the current study, we evaluated the prognostic accuracy of the sPESI and SI in stratifying the risk of 30-day and 3-year mortality in patients with PE. Both the sPESI and SI successfully predicted 30-day and 3-year mortality after acute PE. Our findings demonstrate that the sPESI might identify patients with PE at a low risk of the overall mortality even at 3 years (less than 5% in the low-risk group).

After the diagnosis of PE, the second milestone in the management of patients is risk stratification and assessment of therapeutic options. Over the last decade, numerous prognostic markers have been evaluated in clinical practice, including several clinical parameters,[9,11] right ventricular function assessment,[23] and the plasma level of specific biomarkers.[16,24] A systemic review of the literature has shown that patients with RVD on echocardiography, increased levels of troponin or of B-type natriuretic peptide (BNP) and N-terminal pro-BNP (NT-proBNP), which could indicate numerous diseases such as heart failure or pulmonary hypertension, had an elevated short-term risk of adverse events compared with patients with normal levels of those parameters.[25-28] When used to identify low-risk patients, RVD on echocardiography had an NPV of 96% for a 30-day complicated outcome,[25] and the normal levels of BNP or NT-pro BNP were associated with an early mortality rate of 2.2% and
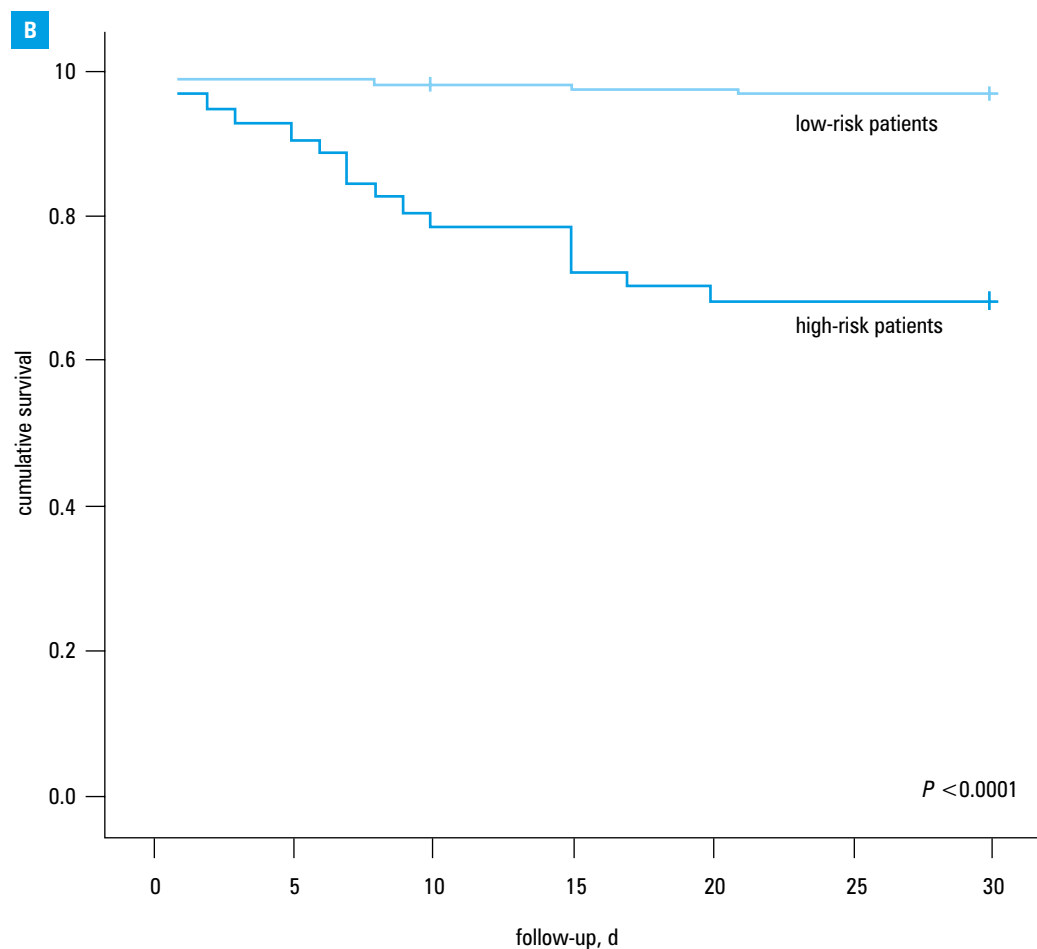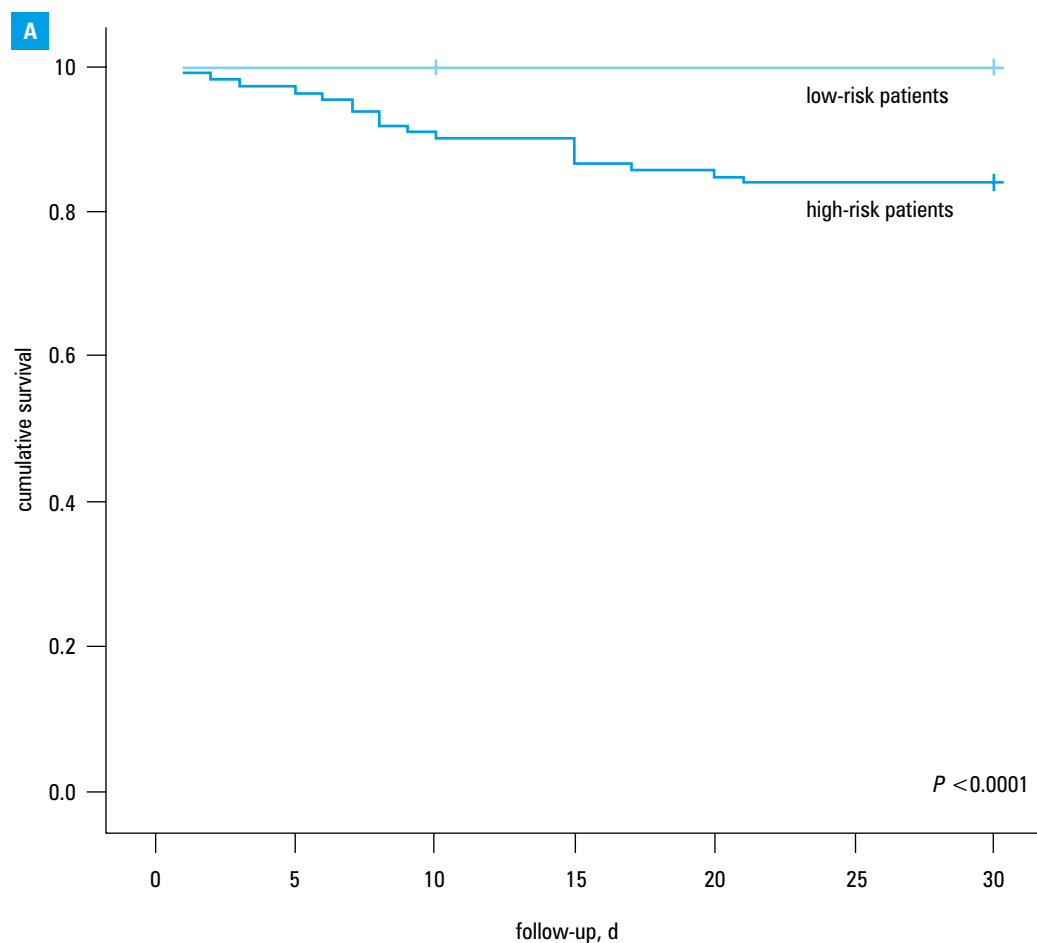
FIGURE 1 Kaplan–Meier curves of 30-day survival for low-risk vs. high-risk patients according to the simplified pulmonary embolism severity index (**A**) and shock index (**B**)

TABLE 3 Usefulness of the simplified pulmonary embolism severity index and shock index for predicting overall 30-day and 3-year mortality in patients with acute pulmonary embolism

	30-day mortality			3-year mortality		
	sPESI	SI	sPES + SI	sPESI	SI	sPESI + SI
sensitivity	100 (78–100)	83 (57–95)	83 (57–95)	93 (82–97)	48 (35–61)	46 (33–60)
specificity	46 (38–53)	80 (73–86)	84 (77–88)	56 (47–65)	84 (77–89)	87 (80–92)
PPV	15 (9–24)	30 (18–45)	34 (20–50)	47 (38–57)	57 (42–70)	61 (45–75)
NPV	100 (94–100)	97 (93–99)	98 (93–99)	95 (87–98)	79 (71–85)	79 (71–85)
PLR	1.85 (1.61–2.12)	4.31 (2.99–6.21)	5.05 (3.41–7.48)	2.1 (1.74–2.63)	3.12 (1.94–5.02)	3.72 (2.20–6.28)
NLR	0	0.20 (0.07–0.58)	0.19 (0.07–0.56)	0.12 (0.04–0.31)	0.61 (0.47–0.78)	0.61 (0.47–0.77)
AUC	0.73 (0.64–0.81)	0.82 (0.71–0.92)	0.51 (0.39–0.69)	0.74 (0.67–0.81)	0.66 (0.57–0.75)	0.52 (0.40–0.73)

Data are presented as percentage (95% confidence interval).

Abbreviations: AUC – area under receiver operating characteristic curve, NLR – negative likelihood ratio, NPV – negative predictive value, PLR – positive likelihood ratio, PPV – positive predictive value, others – see **TABLE 1**

1.3%, respectively, with an overall rate of an adverse outcome of 13% and 5.3%, respectively.[26] Finally, in patients with normal troponin levels, the early mortality rate was 3.7% and the adverse outcome rate was 14.7%.[27]

Clinical prognostic models were developed to identify low-risk patients with PE who may be candidates for outpatient therapy or a shorter hospital stay.[9,11,29] Previous studies described the prognostic validity of the sPESI in assessing the severity of disease according to comorbidities and initial clinical findings collected during the evaluation of PE.[9,14] The hemodynamic status on admission is the most important prognostic factor in patients with PE.

Interestingly, in the current study, there were no deaths in the low-risk group classified using the sPESI at 30 days. Previous studies reported a mortality rate of 0% to 2.8% in normotensive patients with PE, including a low-risk group classified using the sPESI.[24,25,29,30] In the studies of unstable patients with PE, the mortality rate was from 0% to 1.1%.[7,31] Both studies suggested that outpatient treatment was appropriate for low-risk patients.[7,31] The data from those studies are consistent with our findings. The NPV of 100% for 30-day mortality in low-risk patients assessed by the sPESI in the present study illustrates the usefulness of this index in identifying patients eligible for outpatient treatment. As the sPESI was specifically developed to identify low-risk patients with PE, the PPV and PLR for predicting short-term mortality were very low.[29]

Despite the availability of a large amount of data on the short-term prognosis of patients with PE, only a few studies have investigated the potential predictors of long-term prognosis in those patients.[6,27] Most findings focused on PE patients without stratification of prognostic risk factors.[27] In other studies, the follow-up period was limited to the first 3 to 6 months after the initial diagnosis.[5] However, a number of studies showed that some prognostic markers are independently related to the long-term prognosis in patients with PE.[32,33] They demonstrated an association between PE-related factors such as the severity of clinical findings and echocardiographic parameters at the time of the initial diagnosis, and patient-related factors such as cancer, with adverse events in the short term.[2,32] One study demonstrated that 5-year mortality was higher in PE patients with pulmonary arterial pressure of more than 50 mmHg at the time of diagnosis.[33]

Most of those studies did not identify PE patients with low mortality risk. To the best of our knowledge, only a few studies examined the ability of clinical prognostic factors, together with clinical prediction rules, to predict a long-term prognosis in patients with PE.[31,33,34] One of those studies evaluated the performance of the sPESI prognostic model in 525 patients with PE at 3, 6, and 12 months.[34] It reported that the 12-month mortality rate was 8.5% in low-risk patients and 50.5% in high-risk patients.

Although the ability of the sPESI to predict short-term mortality has been confirmed in a few large cohorts,[27] its long-term prognostic accuracy is unknown. In the present study, the long-term prognostic accuracy of the sPESI, together with its short-term prognostic effectiveness, has been investigated for the first time. In our study, stratification into high- and low-risk classes using the sPESI was significantly correlated with the mortality rate for up to 3 years, with the index showing high sensitivity (93%) and NPV (95%) for the overall mortality at 3 years. In addition to classifying high-risk patients, the sPESI was an independent predictor of long-term mortality.

To the best of our knowledge, there is only 1 study published in English that compared the sPESI and SI in terms of their ability to predict short-term mortality in patients with PE.[29] The authors reported that the sPESI had higher sensitivity (95.0%) and NPV (98.4%) compared with the SI. Similarly to the data in that study, we found that the sensitivity (100%) and NPV (100%) of the sPESI for predicting 30-day mortality were higher than the sensitivity and NPV of the SI. The mortality rate in the low-risk group based on the sPESI (1.6%) in the above study[29] was also similar
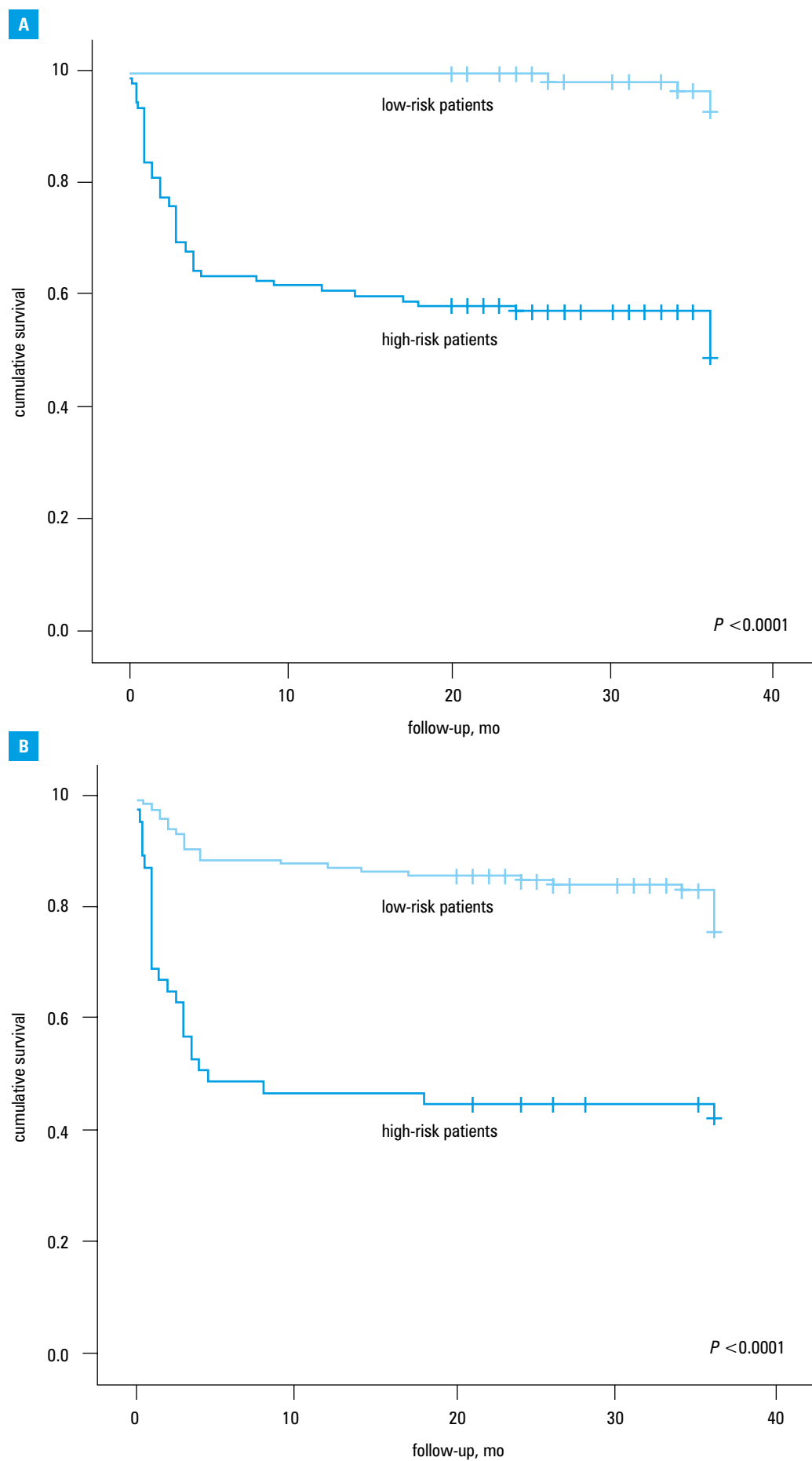
FIGURE 2 Kaplan–Meier curves of 3-year survival for low-risk vs. high-risk patients according to the simplified pulmonary embolism severity index (**A**) and shock index (**B**)

to our findings (0%), although the mortality in the low-risk group assessed by the SI was higher than in our study (8.3% vs. 2.1%). In the present study, the comparison of the 2 models revealed that the sPESI was more accurate than the SI in predicting the overall 3-year mortality.

In line with the study by Sam et al.,[29] in our study, the proportion of patients classified as having low clinical risk by the sPESI was lower than that of patients classified as low-risk by the SI. With regard to clinical decision making, it is important that the sPESI successfully identified a relatively large group (41.7% of the initial study population) of low-risk patients in whom outpatient therapy or short-term hospitalization of acute PE might be considered.

The current study is interesting for a number of reasons. First, to the best of our knowledge, this is the first study in English to assess the accuracy of the sPESI and SI prognostic models in predicting 3-year mortality in symptomatic patients with acute PE. Second, it demonstrated that the sPESI is superior to SI in predicting both 30-day and 3-year mortality, and has higher sensitivity and NPV compared with the SI. As shown in TABLE 3, the AUC of the sPESI was also higher than that of the SI for predicting the overall 3-year mortality. Finally, the identification of a high 30-day mortality rate (30.5%) with the SI in the present study suggests that thrombolytic therapy may be considered in patients with PE. However, such therapy is not suitable for patients classified as high-risk according to the sPESI.

The main limitation of this study is that we did not evaluate adverse events, such as major bleeding and recurrent PE, or PE-related mortality 1 month after the diagnosis of PE. Ideally, a prognostic model should reliably predict PE-related mortality and adverse events. However, in this study, we focused mainly on the overall short- and long-term mortality. Second, although we used prospectively collected clinical data, the sPESI and SI are based on retrospective data.

In conclusion, the sPESI seems to be an optimal prognostic model for risk stratification of short- and long-term mortality in patients with PE. The prognostic accuracy of the sPESI was better than that of the SI in identifying low-risk patients. Based on the results of early mortality in this study, patients identified as low-risk by the sPESI may be considered for out-of-hospital treatment.

Contribution statement TK conceived the idea for the study. TK, HE, and GG contributed to the design of research. All authors were involved in data collection. TK and OK interpreted the data. TK and FI analyzed the data. TK, HE, ZA, and SH were responsible for critical revision of the manuscript. All authors edited and approved the final version of the manuscript.

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ARTYKUŁ ORYGINALNY

Znaczenie rokownicze uproszczonego wskaźnika ciężkości zatorowości płucnej oraz wskaźnika wstrząsu w zatorowości płucnej

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SŁOWA KLUCZOWE

umieralność długoterminowa, umieralność krótkoterminowa, uproszczony wskaźnik ciężkości zatorowości płucnej, wskaźnik wstrząsu, zatorowość płucna

STRESZCZENIE

WPROWADZENIE   Stratyfikacja ryzyka w ostrej zatorowości płucnej (*pulmonary embolism* – PE) za pomocą uproszczonego wskaźnika ciężkości zatorowości płucnej (*simplified pulmonary embolism severity index* – sPESI) i wskaźnika wstrząsu (*shock index* – SI) nie wymaga użycia żadnych dodatkowych narzędzi prognostycznych, takich jak biomarkery czy echokardiografia.

CELE   Celem badania było porównanie sPESI i SI w zakresie zdolności do przewidywania 30-dniowej i 3-letniej śmiertelności z powodu PE.

PACJENCI I METODY   U 194 chorych z potwierdzoną PE zastosowano modele rokownicze oparte na sPESI i SI do prognozowania 30-dniowej (krótkoterminowej) i 3-letniej (długoterminowej) umieralności ogólnej.

WYNIKI   Ogółem, umieralność w badanej kohorcie wyniosła 9,2% w pierwszym miesiącu i 29,9% po 3 latach. Do grupy małego ryzyka w skali sPESI przydzielono mniej chorych (41,7%; 81 ze 194 chorych) w porównaniu z liczbą chorych, którzy uzyskali wynik <1 w skali SI (74,7%; 145 ze 194 chorych). Co ważne, w ciągu 30 dni nie stwierdzono zgonów chorych z grupy małego ryzyka wg sPESI, w porównaniu z 2,1% umieralnością chorych (3 ze 145 chorych) małego ryzyka zidentyfikowanych na podstawie SI. Umieralność 3-letnia wśród chorych z grupy małego ryzyka wg sPESI była mniejsza niż w grupie małego ryzyka wg SI (4,9% *vs* 20,7%; p <0,0001). W analizie wielowariantowej Coxa zarówno SI, jak i sPESI były niezależnymi czynnikami rokowniczymi umieralności 3-letniej, ale tylko SI był niezależnym czynnikiem przewidującym 30-dniową umieralność.

WNIOSKI   Oba modele prognostyczne pozwalają na stratyfikację ryzyka zgonu w czasie obserwacji krótko- i długoterminowej u chorych z PE, ale sPESI lepiej niż SI klasyfikuje chorych do grupy małego ryzyka.

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