Accuracy of Quick Sequential Organ Failure Assessment (qSOFA) Scoring as In-Hospital Mortality Predictor in Adult Patients with Sepsis Secondary to Urinary Tract Infection Admitted in a Local Tertiary Hospital in Davao City: A Cross-Sectional Study

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Abstract

Background: The quick Sequential Organ Failure Assessment (qSOFA) score was introduced by Sepsis-3 or the Third International Consensus Definitions for Sepsis and Septic Shock to help physicians in identifying patients outside the intensive care unit with suspected infection who are at high risk for in-hospital mortality. However, sepsis is not a homogenous entity and the outcomes vary based on several factors. This study aimed to determine the predictive accuracy of qSOFA in identifying those at high-risk of in-hospital mortality among adult patients with sepsis secondary to urinary tract infection.

Methodology: A retrospective cohort study was done involving the use of qSOFA score to predict in-hospital mortality of adult patients with a diagnosis of sepsis secondary to urinary tract infection, admitted in the hospital from January 1, 2013 to December 31, 2020. qSOFA is computed based on the following independent variables: systolic blood pressure (SBP), respiratory rate (RR), and Glasgow Coma Scale (GCS).

Results: Of the 128 charts retrieved, 121 patients were included in the study. Fifteen (12.40%) died while 106 (87.60%) survived. Mean age was 60.76 years old, with more females (71.90%) than males (28.10%). Hypertension and Diabetes Mellitus Type 2 were the most frequent comorbidities. Complicated UTI was the most frequent source of infection. Mean length of stay was 8.29 days. Forty (33.06%) patients had qSOFA ≥ 2 wherein 11 (27.5%) died. Diagnostic performance results revealed: sensitivity (73.33%), specificity (72.64%), positive (27.5%) and negative (95.06%) predictive values, and positive (2.68) and negative (0.37) likelihood ratios. qSOFA accuracy was 72.73% with an AUROC of 0.76.

Conclusion: Among the admitted adult patients with sepsis secondary to a UTI, qSOFA had a good prognostic accuracy for in-hospital mortality.

Keywords: qSOFA, sepsis, UTI, urinary tract infection, in-hospital mortality

Introduction

Sepsis is a life-threatening organ dysfunction due to a dysregulated host response to infection resulting in organ dysfunction, according to the Third International Consensus Definitions for Sepsis and Septic Shock (Sepsis-3). It is therefore appropriate to have tools to identify patients who have high risk for poor outcomes, and at the same time, may be used in a timely manner to improve patient outcomes.[1-3]

In light of the above, the quick Sequential Organ Failure Assessment (qSOFA) was introduced by Sepsis-3 to aid physicians in recognizing those patients not in the intensive care unit (ICU) with suspected infection who are at high risk for mortality.[2] There is neither a gold standard nor a specific test for sepsis[4] since qSOFA is not a diagnostic test but rather a mortality predictor.[5] Nevertheless, it was suggested to be used for the following purposes: as a prompt to investigate patients for any organ dysfunction, as a trigger for the initiation or intensification of therapy, as a suggestion to further monitor the patient more frequently or to refer them to

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critical care, and serve as a prompt for possible infection if not initially considered.[6] qSOFA is a simplified version of the Sequential Organ Failure Assessment (SOFA) which determines the level of organ dysfunction and the risk for mortality specifically in ICU patients but necessitates laboratory examinations such as complete blood count for platelet count, arterial blood gas for PaO_2/FiO_2 ratio determination, serum bilirubin and creatinine levels.[2]

In one study, qSOFA was determined to have poor sensitivity for mortality of 60.8% whereas systemic inflammatory response syndrome (SIRS) criteria had a higher sensitivity of 88.1%.[7] Moreover, in another study, qSOFA had a lower sensitivity of 60.8% compared to the sepsis definition in the said study (SOFA score ≥ 2 outside ICU or increase of ICU admission SOFA ≥ 2) with sensitivity of 87.2% in predicting death. Thus, qSOFA was concluded to have an inadequate sensitivity in the prediction of death. In the same study, there was a 41.2% mortality for qSOFA ≥ 2 while SIRS ≥ 2 had 25.3%.[8]

However, in another study, qSOFA was more accurate in predicting in-hospital mortality for patients with suspected infection, compared to SIRS or severe sepsis which is defined as SIRS score of ≥2 and lactate levels higher than 2 mmol/L or 18 mg/dL. There was an overall 8% in-hospital mortality rate in the said study and patients with qSOFA ≥2 had 24% mortality rate.[9]

Nonetheless, Sepsis-3 also recommends that prospective validations to be conducted in non-US health care backgrounds to validate qSOFA's quality since majority of the data used in their study were from the United States.[6] In one prospective study done in the Philippines, qSOFA score was concluded to be more accurate than SIRS in predicting sepsis, however was not advocated to be used as an initial screening tool. Despite having a specificity of 95.5% compared to SIRS criteria of 60%, qSOFA had lower sensitivity compared to SIRS criteria (46.3% vs 73.7%).[10]

Likewise, qSOFA score has been developed to predict outcomes of patients with suspected infection. Patients hospitalized for sepsis or septic shock are, in general, at increased risk for mortality. However, sepsis is not a homogenous entity and the outcomes vary based on several factors. A key determinant of outcomes in patients with sepsis is the site of infection. In a multi-center, prospective cohort study involving 1,184 adults who were admitted for severe sepsis or septic shock, mortality rates varied depending on the source of infection.[11] The in-hospital mortality rates were highest for CNS infections (47.6%) while it was lowest for urinary tract infection (11.9%).

It has also been argued that a qSOFA score of ≥ 2 may be biased based on its parameters since it is easily affected by the site of infection such as the respiratory tract or the central nervous system.[12] A respiratory rate of ≥ 22 cycles per minute or a Glasgow Coma Scale of <15 could easily gain one point each if it were a respiratory infection or a neurologic condition, respectively.

Considering the reasons above, it can be argued that the qSOFA score may have variability in predicting outcomes when specific sources of infection in sepsis are considered. It would benefit future patients in that qSOFA is a non-invasive tool which can be used to prognosticate patients with sepsis or septic shock, with urinary tract as the source of infection. This would also be of socioeconomic benefit since laboratory exams are not needed in determining the qSOFA score. Given that Philippines is a lower middle-income country, future patients would indeed benefit from using the qSOFA score.[13]

Thus, this study attempted to address the said contention by determining the predictive accuracy of qSOFA in prognosticating in-hospital mortality among adult patients outside the ICU with sepsis secondary to a urinary tract infection.

Methodology

Research Design. The research is a retrospective cohort study on using qSOFA to predict in-hospital mortality.

General Objective. To determine the accuracy of quick Sequential Organ Failure Assessment (qSOFA) as prognostication tool for in-hospital mortality among adults with sepsis secondary to a urinary tract infection admitted in a local tertiary hospital in 2013 to 2020.

Specific Objectives

1. To describe the demographic and clinical profile of adult patients with final diagnosis of sepsis secondary to a urinary tract infection in terms of:
   a. Age
   b. Sex
   c. Co-morbidities
   d. Specific urinary source of infection
   e. Hospital length of stay
   f. Outcome – died or survived
   g. qSOFA score
2. To determine the following accuracy measures of qSOFA as prognostication tool for in-hospital mortality among adults with sepsis secondary to urinary tract infection:
   a. % sensitivity
   b. % specificity
   c. % predictive value of a positive result (qSOFA ≥ 2)
   d. % predictive value of a negative result (qSOFA < 2)
   e. positive and negative likelihood ratios
   f. Accuracy
   g. Area under the receiver operating characteristic (AUROC) curve

Selection of Cases. All clinical charts of patients admitted to Metro Davao Medical and Research Center, Inc. (MDMRCI) in 2013-2020 with diagnosis of sepsis with International Classification of Disease (ICD) code A41.9, secondary to Urinary Tract Infection (UTI).

Inclusion Criteria: Age ≥ 19 years old and charts with information on systolic blood pressure, respiratory rate, and Glasgow Coma Scale (GCS) on the day diagnosis of sepsis was made

Exclusion Criteria: Trauma patients, Pregnant patients, With ongoing cardiopulmonary resuscitation (CPR) on admission, With home against medical advice (HAMA) status, With do-not-resuscitate (DNR) and/or do-not-intubate (DNI) order on admission

Computation of Sample Size. Based on the Cochran's Sample Size Formula, with a prevalence of 50%, at least 385 patients are needed to detect a significant difference at an alpha error of 5%.[14]

Data Collection Process. After the approval from the Metro Davao Medical and Research Center, Inc. - Anda Riverview Medical Center, Inc. Cluster Research Ethics Review Committee was given, the primary investigator began the data collection. The charts of patients with diagnosis of sepsis secondary to a urinary tract infection with admissions from January 1, 2013 to December 31, 2020 with ICD code number A41.9 were retrieved from the Medical Records Section of the Metro Davao Medical and Research Center, Inc.

To eliminate bias, each of the gathered chart was assigned a code based on the medical record (MR) locator with format of xx-xx-xx. Data were obtained from the available details in the chart, whether it be on the face sheet, history sheet, and/or admitting medical orders and side notes. Details on age and sex were taken from the face sheet. Information on comorbidities were taken from the history sheet, side notes of residents or consultants. The specific urinary source of infection was taken from the history sheet, residents' and consultants' notes.

The total number of hospital days was derived from the details taken from the face sheet: date of admission and date of discharge. The outcome was taken from the face sheet which can be found on the lower section of the page. The dependent variable, qSOFA score, was computed based on the following independent variables: systolic blood pressure (SBP), respiratory rate (RR), and Glasgow Coma Scale (GCS) which were taken from the recorded information on the day when the patient was diagnosed to have sepsis secondary to urinary tract infection. If several measurements of these variables were taken, the worst value was obtained. Each variable was scored as one point if SBP was ≤ 100, RR was ≥ 22 cycles per minute, and GCS was < 15.

All these data were recorded in the Data Collection Form (Appendix) by the program leader. All the collected data were entered in a spreadsheet program of a password-protected laptop and were analyzed accordingly.

Data Analysis. All categorical characteristics were presented in frequency and proportion.

Continuous characteristics were summarized as mean ± standard deviation using JASP Software. Furthermore, to determine the accuracy of qSOFA as prognostication tool for in-hospital mortality due to sepsis secondary to urinary tract infection, the following were computed using SPSS: % sensitivity, specificity, predictive value of a positive result (qSOFA ≥ 2), predictive value of a negative result (qSOFA < 2), positive and negative likelihood ratios, accuracy, and area under the receiver operating characteristic (AUROC) curve.

Ethical Considerations. Voluntary consent and informed consent were not required since the study involved a retrospective chart review. Each of the patient was assigned a code according to the medical records (MR) locator, to deidentify the patients and maintain their anonymity. The data needed were extracted from the charts and were recorded in the data collection forms prepared, one for each patient.

After all the details were recorded in the data collection forms, these were tallied and entered in a spreadsheet program of a password-protected laptop. The data collection forms would be stored for two years in a safe storage with lock which only the primary investigator has access to. The risk was minimal as patients were deidentified.

Ethical approval was obtained from the Cluster Research Ethics Review Committee (CRERC) of MDMRCI prior to the conduct of the study.

Definition of Terms

In-hospital mortality - Death during a patient's confinement

qSOFA (quick Sequential/Sepsis-related Organ Failure Assessment) score - It identifies patients who are at high risk for in-hospital mortality when ≥ 2 out of three criteria are met with one point for each: systolic blood pressure ≤ 100 mmHg, tachypnea ≥ 22 breaths per minute, or altered mentation with Glasgow Coma Scale of < 15, all taken on the day sepsis was diagnosed.

Sepsis - It refers to the condition wherein the patient was diagnosed to have a dysregulated host response to an infection with no need of vasopressor therapy and is still responsive to fluid resuscitation.[4] For this study, diagnosis of sepsis is based on the final diagnosis with ICD code A41.9 found in the face sheet.

Septic shock - It is a subset of sepsis and is a condition diagnosed by the physician wherein patients who have sepsis are refractory to fluid resuscitation, noting hypotension and needing vasopressor therapy.[4] It is found in the face sheet of the patient's chart with respective dispositions: discharge, transferred, recovered/improved, home against medical advice, absconded, unimproved, or expired. For this study, diagnosis of sepsis is based on the final diagnosis with ICD code A41.9 found in the face sheet.

Urinary Tract Infection (UTI) - It refers to one of the following: Catheter-Associated Urinary Tract Infection, Complicated Urinary Tract Infection, Hydronephrosis, Nephrostomy Tube, Pyelonephritis, Stents, and Urolithiasis. Information on the presence of UTI will be obtained from final diagnosis on the face sheet of the clinical chart.

Results

From January 2013 to December 2020, a total of 128 charts were retrieved (*Figure 1*). However, a total of seven

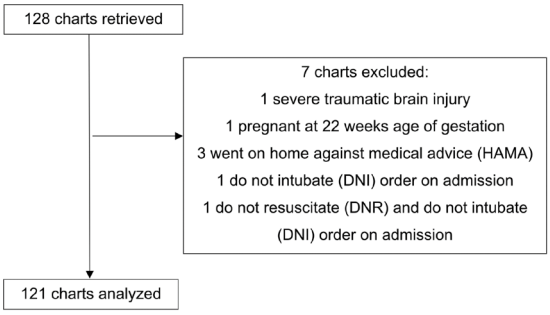

Figure 1. Charts retrieved and analyzed

charts were excluded: one had severe traumatic brain injury, one was pregnant at 22 weeks age of gestation, three went on home against medical advice (HAMA), one had do not intubate (DNI) order on admission, one had do not resuscitate (DNR) and do not intubate (DNI) orders on admission, leaving a total of 121 charts included in the study.

Study Population of Sepsis Secondary to Urinary Tract Infection. The study population comprised of 121 patients. Fifteen (12.40%) out of 121 patients succumbed to death inside the hospital while 106 (87.60%) survived. Of those who died, eight died at the ICU and seven at the wards. Among those who died, six were due to Sepsis and Septic Shock, and with one patient having concomitant peritonitis. Other causes of death were due to Acute Respiratory Failure Type 4, Septic Shock with one (6.67%) patient, Multiorgan Failure with two (13.33%) patients, and one (6.67%) patient from each: Cardiopulmonary Arrest secondary to Cardiac Arrhythmia, Sepsis, and Multiorgan Failure. The other three patients died due to Myocardial Infarction and Fatal Arrhythmia Secondary to ST Elevation Myocardial Infarction (STEMI) with concomitant Sepsis and Septic Shock secondary to Complicated UTI.

Patient Characteristics. The demographic and clinical profile of patients with final diagnosis of Sepsis Secondary to a Urinary Tract Infection from 2013 to 2020 are seen in *Table I*.

The mean age of the patients in the study was 61 (±17.27) years old. Those who died had a mean age of 64 (±16.69)

Table I. Demographic and Clinical Profile of Adult Patients with Final Diagnosis of Sepsis Secondary to a Urinary Tract Infection according to Specified Variables

Variables (Characteristics)	Died n = 15	Survived n = 106	Total n = 121
Age in years, mean (SD)	64.27 (±16.69)	60.26 (±17.37)	60.76 (±17.27)
Sex, n (%)			
Male	6 (40.00)	28 (26.42)	34 (28.10)
Female	9 (60.00)	78 (73.59)	87 (71.90)
Comorbidities, n (%)			
AIDS	1 (6.67)	0	1 (0.83)
Bronchial Asthma	0	7 (6.60)	7 (5.79)
Cerebrovascular Disease	3 (20.00)	14 (13.21)	17 (14.05)
Chronic Kidney Disease not on Dialysis	3 (20.00)	22 (20.76)	25 (20.67)
Chronic Kidney Disease on Dialysis	4 (26.67)	7 (6.60)	11 (9.09)
Congestive Heart Failure	0	7 (6.60)	7 (5.79)
Coronary Artery Disease	2 (13.33)	22 (20.76)	24 (19.23)
Chronic Obstructive	1 (6.67)	0	1 (0.83)
Pulmonary Disease	1 (6.67)	9 (8.49)	10 (8.26)
Connective Tissue Disease/ Rheumatologic Disease	2 (13.33)	49 (46.23)	51 (42.15)
Diabetes Mellitus Type 2	2 (13.33)	13 (12.26)	15 (12.40)
Hematologic	7 (46.67)	51 (48.11)	58 (47.93)
Hypertension	1 (6.67)	1 (0.94)	2 (1.65)
Liver Cirrhosis	4 (26.67)	13 (12.26)	17 (14.05)
Malignancy with Chemotherapy Use		6 (5.66)	9 (7.44)
Malignancy without Chemotherapy Use	3 (20.00)		
Myocardial Infarction	6 (40.00)	10 (9.43)	16 (13.22)
Peripheral Vascular Disease	1 (6.67)	3 (2.83)	4 (3.31)
Specific Urinary Source of Infection, n (%)			
Catheter-Associated UTI	5 (33.33)	16 (15.09)	21 (17.36)
Complicated UTI	8 (53.33)	88 (83.02)	96 (79.34)
Hydronephrosis	0	2 (1.89)	2 (1.65)
Nephrostomy Tube	2 (13.33)	1 (0.94)	3 (2.48)
Pyelonephritis	0	28 (26.42)	28 (23.14)
Stents	0	2 (1.89)	2 (1.65)
Urolithiasis	0	12 (11.32)	12 (9.92)
Length of Hospital Stay, mean (SD)	12.53 (±18.82)	7.69 (±6.53)	8.29 (±9.01)

Table II. Frequency Distribution of Adult Patients with Final Diagnosis of Sepsis Secondary to a Urinary Tract Infection According to qSOFA Score

qSOFA score	Died n=15 (%)	Survived n=106 (%)	Total n=121 (%)
0	-	26 (24.53)	26 (21.49)
1	4 (26.67)	51 (48.11)	55 (45.45)
2	9 (60.00)	23 (21.70)	32 (26.45)
3	2 (13.33)	6 (5.67)	8 (6.61)
< 2	4 (26.45)	77 (72.64)	81 (66.94)
≥ 2	11 (73.33)	29 (27.36)	40 (33.06)

Table III. Distribution of Cases according to qSOFA Score and Outcome

qSOFA Score	Outcome		Total
	Died	Survived	
≥ 2	11	29	40
< 2	4	77	81
Total	15	106	121

Table IV. Summary of Diagnostic Performances of qSOFA in Predicting In-Hospital Mortality

Diagnostic Performance	qSOFA
Sensitivity, % (95% CI)	73.33 (44.90-92.21)
Specificity, % (95% CI)	72.64 (63.13-80.85)
Predictive Value, % (95% CI)	
Positive	27.5 (19.71-36.95)
Negative	95.06 (89.19-97.82)
Likelihood Ratio (95% CI)	
Positive	2.68 (1.73-4.14)
Negative	0.37 (0.16-0.86)
Accuracy, % (95% CI)	72.73 (63.88-80.43)
AUROC (95% CI)	0.76 (0.65-0.87)

years old, while those who survived had a mean age of 60 (±17.37) years old. Among the 121 patients, there were a total of 34 (28.10%) males and 87 (71.90%) females. A total of 15 patients died while 106 patients survived. Among those who died, nine (60%) were females while six (40%) were males. Among those who survived, 78 (73.59%) were females while 28 (26.42%) were males.

Likewise, among the 17 co-morbidities listed in *Table I*, Hypertension and Diabetes Mellitus Type 2 had the highest frequencies of 58 (47.93%) [died = seven (46.67%), survived = 51 (48.11%)] and 51 (42.15%) [died = two (13.33%), survived = 49 (46.23%)], respectively. These were followed by Chronic Kidney Disease not on Dialysis and Coronary Artery Disease with total frequencies of 25 (20.67%) [died = three (20.00%), survived = 22 (20.76%] and 24 (19.23%) [died = two (13.33%), survived = 22 (20.76%)], respectively.

On the other hand, the least frequent comorbidities were as follows: Liver Cirrhosis with a total of two (1.65%) patients [died = one (6.67%), survived = one (0.94%)], while Acquired Immunodeficiency Syndrome (AIDS) and

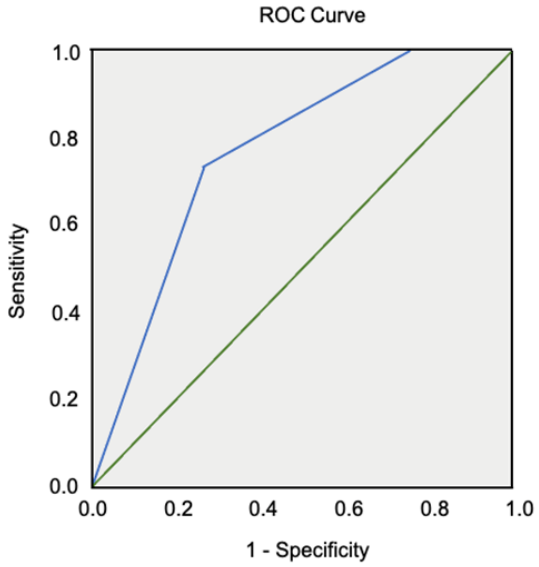

Figure 2. qSOFA Receiver Operating Characteristic Curve for In-Hospital Mortality

Chronic Obstructive Pulmonary Disease (COPD) both had frequencies of one, of whom both also died (6.67%).

Moreover, for the Specific Source of Infection, the highest frequency was that of Complicated UTI, with 96 (79.34%) out of the total 121 patients. Of the 96 patients with Complicated UTI, eight (8.33%) patients died while 88 (91.67%) survived. Furthermore, the second highest frequency was that of Pyelonephritis with 28 (23.14%) patients, of whom all survived. The third highest frequency was that of Catheter-Associated UTI with 21 (17.36%) patients. Out of the 21 patients, five (23.81%) died while 16 (76.19%) survived.

The third to the lowest frequency was that of Urolithiasis with a total of 12 (9.92%) patients and all survived. The second to the lowest frequency was that of Nephrostomy Tube with three (2.48%) out of 121 patients. Two (66.67%) out of the said three patients succumbed to death while only one (33.33%) survived. On the other hand, both Hydronephrosis and Stents had two patients each and all survived.

As for the length of hospital stay, the overall mean was 8.29 (±9.01) days. Those who died had a longer hospital stay with 12.53 (±18.82) days compared to 7.689 (±6.53) days for those who survived.

qSOFA Score. The frequency distribution of adult patients with final diagnosis of Sepsis Secondary to a Urinary Tract Infection according to qSOFA score is found in *Table II*.

For the qSOFA score, the highest frequency was 55 (45.45%) under qSOFA score of one, of which, four (26.67%) died while 51 (48.11%) survived. The second highest frequency was 32 (26.45%) under qSOFA score

of two, of which, nine (60.00%) died while 23 (21.70%) survived. Twenty-six patients had qSOFA score of zero, all (26.53%) of whom survived. On the other hand, qSOFA score of three had the lowest frequency, with a total of eight patients, two (13.33%) died while six (5.67%) survived.

Overall, the frequency of qSOFA < 2 was greater than that of qSOFA ≥ 2, with 81 out of 121 (66.94%) patients and 40 out of 121 (33.06%), respectively. Of the 40 patients with qSOFA ≥ 2, 11 (27.5%) died while 29 (72.5%) survived, compared to the 81 patients with qSOFA < 2, with only 4 (4.94%) patients who died while 77 (95.06%) survived.

Diagnostic Performances of qSOFA. The sensitivity of qSOFA with a cut-off of ≥ 2 was 73.33% and its specificity in predicting in-hospital mortality was 72.64%. Its positive predictive value was 27.5%, while its negative predictive value was 95.06%. These were computed based on the data presented in Table III. A summary of the diagnostic performances of qSOFA is found in *Table IV*.

As for the area under the receiver operating characteristic (AUROC) curve, it was 0.76 (95% CI, 0.65-0.87) as illustrated in *Figure 2*.

Discussion

In this study, the mean age of patients was 60.76 (±17.27) years old. This is close to the mean age of 68 years old in another study among patients with complicated UTI.[9] Likewise, majority of the patients in the study were female with 87 (71.90%) out of 121. Indeed, UTI occurs more frequently in females compared to males.[4] In a study, 54.2% were females while 45.8% were males.[15]

Moreover, the top frequencies among the comorbidities were Hypertension with 58 out of 121 patients (47.93%), followed by Diabetes Mellitus Type 2 with 51 patients (42.15%), subsequently followed by Chronic Kidney Disease not on Dialysis with 25 patients (20.67%). Indeed, as cited in a study, diabetes and chronic renal failure are some of the high-risk factors for sepsis secondary to UTI,[16] which is evident in this study. Other high-risk factors were: old age, female, anemia, stone diameter of > 2.5 cm, chemotherapy or steroid use, and long operation time.[16]

Similarly, in another study, among the 85 patients who died, majority of them had Chronic Kidney Disease (30 patients) as a comorbidity. This was closely followed by Renal Impairment with 29 patients though only out of 83. Congestive Heart Failure and Cancer each had 27 patients while Diabetes and Dementia each had 23 patients.[15]

Furthermore, complicated UTI had the highest frequency among the specific sources of infection, with 96 (79.34%) patients. With the results of 23.81% death in those with Catheter-Associated UTI and 66.67% death in those with Nephrostomy Tube, this could signify that the presence of a foreign object greatly contributes to the poor outcome of the patients' condition.

As for the length of hospital stay, the mean was 8.29 (±9.01) days. This is close to one study with a median length of hospital stay among patients hospitalized with complicated UTI with seven days, with interquartile range of five to 13 days.[17] Those who died had longer hospital stays which is 1.63 times more than those who survived which is expected when treating complicated cases.

This study showed that among the 121 adult patients with sepsis secondary to urinary tract infection (UTI), the in-hospital mortality prevalence was 12.40%, that is 15 patients. The rest of the 106 (87.60%) patients survived. In the same manner, a study comprising 1,184 adults ≥ 16 years old admitted to the ICU, it noted a crude mortality rate of 11.9% for urinary tract infection.[11] Likewise, there is 24% in-hospital mortality for those with qSOFA ≥ 2, with an overall in-hospital mortality of 8%.[9]

Furthermore, this study had a higher sensitivity (73.33%) of qSOFA, compared to a prospective cohort study done in the Philippines with 295 adult patients with suspected infection with a sensitivity of 46.3% for qSOFA,[10] However, this study had a qSOFA with lower specificity of 72.64% compared to another study with 95.5% specificity.[9] Those who died also had higher qSOFA score of ≥ 2 than those who survived. Truly, as it has been concluded in a study among 66,522 non-ICU patients with suspected infection in a validation cohort, qSOFA score of ≥ 2 have three to 14 times higher risk for in-hospital mortality with suspected infection outside the ICU than those qSOFA scores < 2.[5]

In a meta-analysis involving six studies which involved 17,868 patients with pneumonia, the pooled sensitivity of a qSOFA score ≥ 2 in predicting mortality is 43% (95% CI, 0.33-0.53) which is lower compared to the result of this study with 73.33% (95% CI, 44.90-92.21). Likewise, in comparison to the same meta-analysis mentioned, the specificity of qSOFA ≥ 2 is higher with 86% (95% CI, 0.76-0.92) compared to the result of this study at 72.64%.[18]

Moreover, as for the positive predictive value, there is 27.5% (95% CI of 19.71-36.95) probability that the patients with qSOFA score ≥ 2 will die. This is close to one study with a positive predictive value of 24 (95% CI of 18-30).[9] For the negative predictive value, there is a 95.06% (95% CI of 89.19-97.82) probability that those with qSOFA score < 2 will survive. In the same manner, this is close to the same study with a negative predictive value of 97% (95%CI of 95-98).[9] Overall, the accuracy of 72.73% means that qSOFA ≥ 2 is 72.73% correct in predicting in-hospital mortality. This value is also close with a study with computed accuracy of 78.79%.[9]

As for the likelihood ratio, this study had a positive likelihood ratio of 2.68. This means that the likelihood of in-hospital mortality in those with qSOFA ≥ 2 is 2.68 times more than qSOFA <2. On the other hand, the negative likelihood ratio was 0.37. This means that there is 0.37 times likely that those who died have qSOFA < 2 than those who survived. This is close to a prospective cohort study involving 879 patients, which yielded 3.40 and 0.37 for the positive and negative likelihood ratios of qSOFA, respectively, among patients with suspected infection.[9]

qSOFA had a good prognostic accuracy of predicting in-hospital mortality with an area under the receiver operating characteristic (AUROC) curve of 0.76 (95% CI, 0.65-0.87). This is close to one international study involving 879 patients with an AUROC of 0.80 (95% CI, 0.74-0.85).[9]

However, this study also had limitations. The sample size was small given that the patients were taken from the admissions of the institution only since it started operations last 2013 and data were gathered until the year 2020. It is therefore recommended that for future studies, the sample size could be expanded in order to yield more accurate findings. A multicenter prospective study could be done to achieve this. The diagnostic test performances also had wide confidence intervals which makes it less precise. This is likely due to the small sample size since the initial computed sample size was not achieved. As for the strengths of the study, there were no missing data. Nevertheless, despite the limited sample size, results compare to other larger studies with alternate sources of infection.

Conclusion

Among the admitted adult patients in the institution with sepsis secondary to a UTI, qSOFA had a good prognostic accuracy for in-hospital mortality. Hence, this study helps strengthen and contribute to the pool of data on the reliability of qSOFA.

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Conflict of Interest. The authors declare that there is no conflict of interest.

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