Systematic Reviews of Hospital Readmission Risk Screening: Reflective Case Study of Older Adults with Stroke

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Abstract

Stroke remains a leading cause of death and disability, with older adults disproportionately affected. This study aimed to investigate stroke patients' short- and long-term readmissions to develop a new readmission risk screening tool (RRST) by conducting a systematic review and examining reflective cases reported to validate screening applications. Methods: A comprehensive search was conducted on 4 databases; eligible systematic reviews via CINAHL, MEDLINE/PubMed, Ovid UML, and Cochrane Library, with 14 research articles emerging to be content extracted as the 1st draft. Expert opinion assessed findings, then revised them to develop a new RRST draft and checked it with a reflective quality check of 4 selected, screened cases. The review identified 14 studies using 5 screening tools. ISAR, TRST, and HOSPITAL score showed low to moderate validity and moderate to good reliability. The Risk Readmission Assessment Tool (RRAT) and LACE index validity and reliability scores were low to moderate. Hospital readmission predictors were hospital admission history, polypharmacy, cognitive and memory problems, the need for help, difficulties in walking, length of stay, and comorbid conditions. The 4 cases reported reflecting the developed RRST screening showed all common features. Value-added, the new RRST could accurately predict high-risk hospital readmission groups; the extended RRST tool screening quality is to be verified in clinical and community trials.

Keywords: Stroke, Hospital readmission, Systematic reviews, Case report, Screening tool

Introduction

Stroke is a significant cause of morbidity and mortality and the 2nd leading cause of death worldwide in both developing and developed countries [1]. According to a rough estimate, its incidence has been increasing recently among Asian countries [2]. Stroke is a critical incident situation but probably results as a sign of long-term impacts on individual life. Hospital readmission of stroke patients has been one of the most fundamental problems of the healthcare system for the last decade [3,4]. The stroke readmission rate is an indicator of health care quality domains, including effectiveness, patient-centeredness, and efficiency [5]. The risk factors for stroke readmission are usually categorized as modifiable and nonmodifiable factors for risk prevention. However, little can be done to control nonmodifiable risk factors such as age and sex. It is essential to focus on managing the modifiable risk factors in this group of individuals to minimize risk [6]. However, there is no comprehensive, holistic measure or tool to screen readmissions for older adults with a stroke. Imperfections of existing screening tools result from: 1) Ineffective measurement, 2) No independent identification of factors, only correlation, 3) Too many items considered, 4) Association with other factors, and 5) Complexity of use.

Additionally, there is no quality readmission screening tool for older adults with stroke in primary practice in Thailand. There is a need to develop a quality screening tool for detecting hospital readmission risk among elderly stroke patients before discharge. Hence, this study aimed to identify and

assess the stroke risk screening of elderly stroke patients before hospital discharge to home by exploring and synthesizing systematic reviews and testing the practicability and efficacy of a new screening tool. To effectively construct a risk screening tool for hospital readmission among elderly stroke patients is a development for addressing unplanned hospital readmission risk detection in a practical way for Thai stroke patients and provides significant added value to stroke care.

Materials and methods

Study design
A 2-step descriptive research design was conducted as follows;

Step 1: Systematic reviews in the medical and health science research to explore, select, sequencing, summarize, and evaluate RRST for older adults. Verifying content validity by indexes of Item-Objective Congruence (IOC) was performed by a panel of 9 experts and an in-depth interview of 2 selected experts directly involved in the comprehensive care and treatment of stroke patients to remove unclear or obscure items in the new tool construction.

Step 2: New tool implementation and evaluation in a pilot project in a stroke unit and 4 model case illustrations to predict the outcome measures. The total reflective cases were 30 stroke patients who were first admitted during 2018 - 2019 at Prasat Neurological Institute in Bangkok, Thailand. The subjects were reassessed through follow-up processes in the 1st month (2 - 4 weeks) and 6 weeks after hospital discharge.

Measurement outcome
For 1 primary outcome, the researchers conducted a review examining published research related to RRST for older adults. Four databases, CINAHL Plus with Full Text (Ebsco), MEDLINE/PubMed (Ebsco), Ovid UML Journals@Ovid (University of Massachusetts, Lowell Subscribed content), and Cochrane Library (Wiley), were searched using medical subject headings and keywords with the following terms: Readmission, Risk Assessment, Tools and Older adults. Terms were sought in titles, abstracts, or keywords. In addition to guarantee adequate and efficient coverage the relevant publications, Google Scholar was searched using similar medical subject headings and keywords.

The criteria for inclusion were: 1) The paper was in the English language, 2) It was original research, 3) The research was primarily of a quantitative type, 4) The paper was published during January 2000 - January 2017, 5) It included tools, qualities and factors related to hospital readmission of older adults, and 6) The study included outcome or results of readmission of older adults and the predictive validity of the tool on 1 or more outcomes. The exclusion criteria were: 1) It was either a systematic review, qualitative research, case study, or case report, and 2) It had a duplicate or irrelevant title or abstract. If the inclusion of the article was in doubt, a decision was made by 2 reviewers. The search flowchart and selection process are presented in **Figures 1** and **2**.
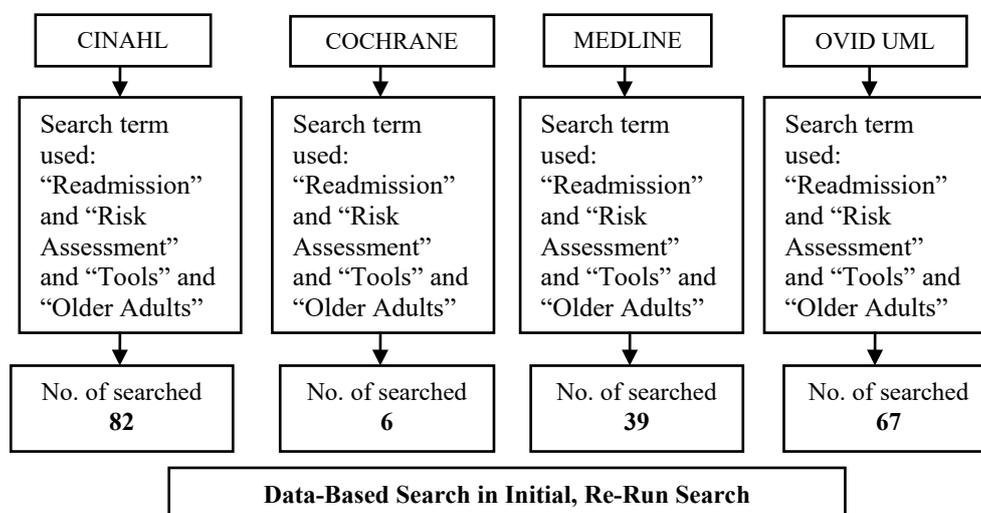

Figure 1 Numbers of research articles from 4 databases regarding Stroke Screening Tools.

Data extraction

Data were extracted from the studies concerning the population, setting, sample size, reliability, validity, measurement, predictors, and outcome. We used the PRISMA checklist when writing our report [7]. Fourteen studies using 5 screening tools were identified. Based on the author's advanced scale screening tools, ISAR, TRST, HOSPITAL score, and the RRAT showed low to moderate validity and moderate to good reliability. The LACE index validity score was low to moderate. The most often identified predictors of hospital readmission were hospital admission history, polypharmacy, cognitive and memory problems, the need for help, difficulties in walking, length of stay, and comorbid conditions.

A pool of items emerged from systematic reviews and was developed for the initial prototype version of the 1st draft of the Hospital-RRST.
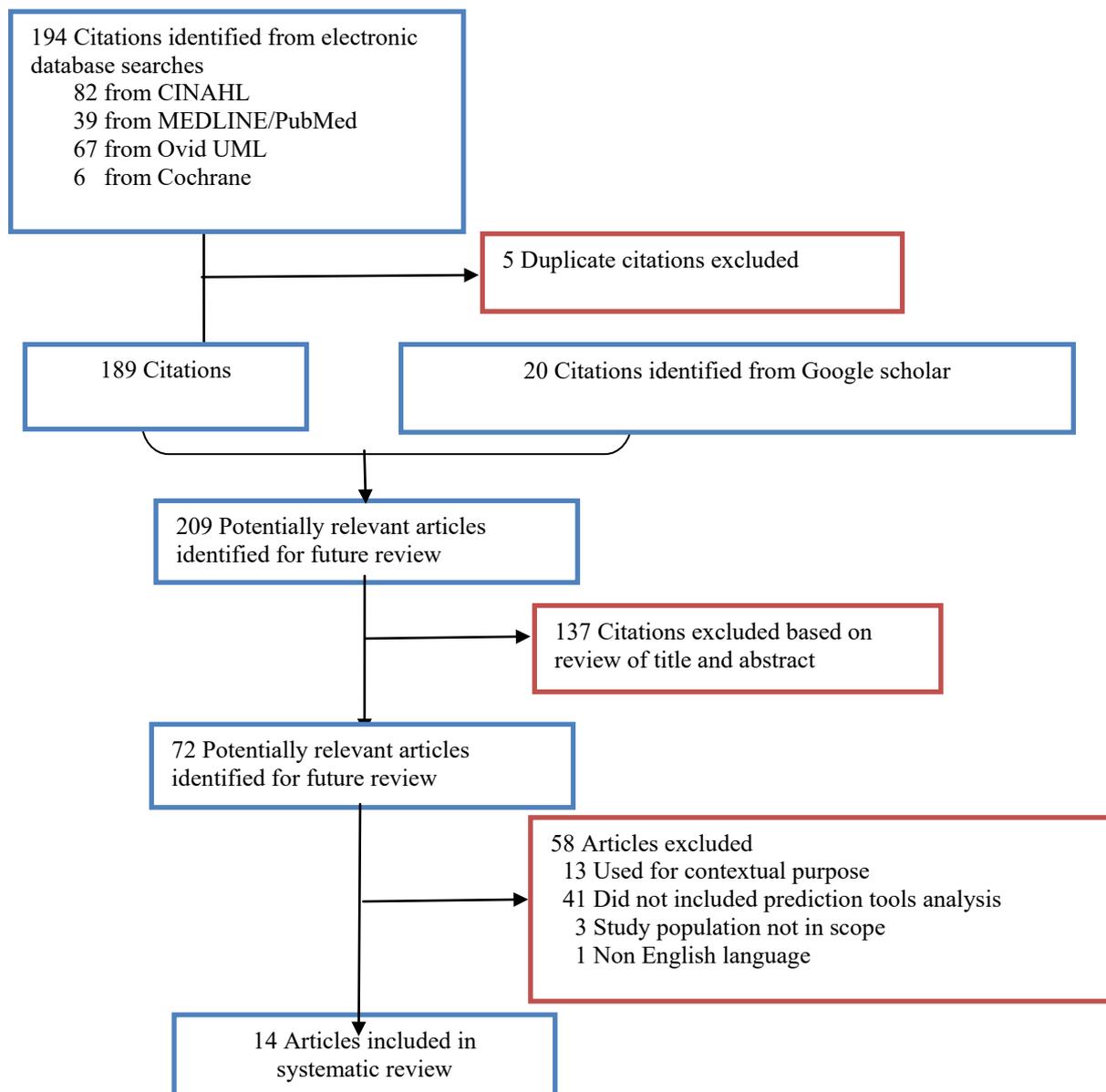
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┌─────────────────────────────────────┐
│ 194 Citations identified from        │
│ electronic database searches         │
│      82 from CINAHL                  │──────────────► ┌──────────────────────────────┐
│      39 from MEDLINE/PubMed          │                │ 5 Duplicate citations excluded│
│      67 from Ovid UML                │                └──────────────────────────────┘
│      6  from Cochrane                │
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┌─────────────────┐          ┌──────────────────────────────────────────┐
│ 189 Citations   │          │ 20 Citations identified from Google scholar│
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┌──────────────────────────────┐
│ 209 Potentially relevant      │
│ articles identified for       │──────► ┌──────────────────────────────┐
│ future review                 │        │ 137 Citations excluded based │
└──────────────────────────────┘        │ on review of title and abstract│
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┌──────────────────────────────┐
│ 72 Potentially relevant       │
│ articles identified for       │──────► ┌──────────────────────────────────────┐
│ future review                 │        │ 58 Articles excluded                 │
└──────────────────────────────┘        │   13 Used for contextual purpose     │
                                         │   41 Did not included prediction tools│
                                         │      analysis                        │
                                         │    3 Study population not in scope    │
                                         │    1 Non English language             │
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┌──────────────────────────────┐
│ 14 Articles included in       │
│ systematic review             │
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Figure 2 Steps of selecting, sequencing, and assessing the research articles from 4 databases regarding the Stroke Screening Tool.

Itemized reviews

Nine experts gathered a panel for validating content validity. This study's panel included 4 medical doctors, 3 nurse instructors, and 2 head nurses studying and working in stroke care for older adults who assessed multiple factors affecting the hospital readmission risk screening of stroke in the elderly. After reviewing and revising the 1st draft of RRST, the 2nd draft of the RRST was constructed. Then a pilot study was conducted among 30 older adults with stroke during October 2019 - February 2020.

For research with human subjects, ethical considerations were necessary. Before implementation of the study protocol, approval was obtained by the Human Research Ethics Committee COA, No. MUPH, 2016-119 (Renewal until 2019). Furthermore, the Prasat Neurological Institute's human rights committee approved the study protocol number 049/2561.

Data analysis

Descriptive statistics applied indexes of IOC as the content validity Index; the proportion of items with expert's agreement should not be less than 0.8 [8].

Results and discussion

Characteristics of studies selected

Firstly, electronic database searches and reference lists yielded 209 citations. Through the elimination process depicted in **Figure 2**, 14 studies were included in this systematic review (**Figure 1**). Finally, 5 primary readmission prediction tools were identified: Identification of Seniors at Risk screening tool (ISAR); Triage Risk Stratification Tool (TRST), HOSPITAL score; RRAT; some of the studies used a combination of 2 tools, the ISAR and TRST tools [9-11], and the LACE index.

A standard outcome measure was the 30-day hospital readmission [12-15]. Several studies conducted repeated readmission measures at 30, 90, 120, and 365 days after discharge [9-11,16-19]. Most of the research studies did not specify the medical condition of older adults. The most commonly used study design was the prospective cohort study [12-15]. One study used an interventional evidence-based project with pre-and post-analysis [20].

Description summary of the RRST

The 1st draft included 5 tools (62 items) described below:

Identification of the Seniors-Risk Screening Tool (ISAR)

The ISAR is a quick and easy screening tool first validated in an emergency department (ED) in Canada. The ISAR has 6 items that assess a person's needs for help regularly (i.e., home care, home nursing services, or support from relatives or others). It is related to the need for support (personal care) that is more than usual for self-care after illness, history of hospital admissions, visual problems, memory problems, and polypharmacy (more than 3 drugs). Most studies used the ISAR to predict older adult readmission to the ED. Some studies, such as Edmans *et al.* [21], added mental well-being and quality-of-life components to the assessment tool.

Triage Risk Stratification Tool (TRST)

The TRST was developed and primarily used to screen older adults in the ED in Switzerland, Belgium, Canada, and the United States of America. The TRST comprises 5 items: Cognitive impairment, difficulties of walking or transfer, polypharmacy, admission to the ED during the past month or hospitalization within the past 3 months [9-11,18]. Some studies added variables such as living alone with no caregiver. The reliability testing results showed the area under the curve was 0.61 with a cut-off score of 2 [18] and a sensitivity of 73 %, a specificity of 75 %, and a negative predictive value of 92 %. [10].

HOSPITAL score

The studies included in this review used this tool to predict hospital readmission and internally validate a prediction model for potentially avoidable 30-day hospital readmissions [12,14]. The HOSPITAL score consists of 6 items: Low hemoglobin at discharge, discharge from an oncology service, low sodium level at release, procedures during a hospital stay, index admission type (urgent or emergency), and several hospital admissions during the previous year with the length of stay $\geq$ 5 days. The validity test showed a C statistic of 0.72, indicating good discrimination for hospital readmission [12].

Risk Readmission Assessment Tool (RRAT)

This tool's purpose was to determine whether the patient was at high risk for readmission [13,15]. The RRAT contains 7 items including: insurance status, marital status, having a regular physician, number of admissions within the past calendar year, length of stay, the comorbidity index score, and the physical component of Short Form-12 Health Survey. In some studies, such as Boraiah *et al*. [15], validity results were low to moderate. The reliability testing results showed the area under the curve was 0.61 with a cut-off score of 2 [18].

LACE index

This index aimed to quantify unplanned readmissions [20, 22]. The LACE index consists of 4 items: Length of stay, acuity of admission, comorbid conditions, and whether the ED was used in the 6 months before admission. The validity test showed that scores using the LACE index ranged from 0 to 19 and was very accurate at predicting outcome risk [22].

The 2nd draft of RRST

Sixty-two items consisted of a stroke patient screening checklist modified to be a questionnaire comprised of 5 parts:

1) ADL (applied the original source from the Barthel Index) consists of 10 items = 100 scored, rating scale; 10 = able to do all, 5 = do some, 0 = cannot do. Additionally, the interpretation; 0 - 20 scored = high risk, 25 - 90 scored = middle risk, 95 - 100 scored = low risk.

2) IADL (modified originality source from Instrument Activities of Daily Living Scale) consists of 8 items = 8 scored (full scored), rating scale; 8 = able to do, 2 - 7 = do some, 0 - 1 = cannot do. Additionally, the interpretation; 0 - 1 scored = high risk, 2 - 7 scored = middle risk, 8 scored = low risk.

3) Health Risk Behavior (HRB): **(**applied originality source from chronic care and expert opinion) all items were rated a 2-points; 2 = able to do, 1 = cannot do (28 items, full scored = 56; 100 %). The summative response scale with HRB interpretation; < 20 % = high risk, ≥ 20 ± 79 % = moderate risk, ≥ 80 = low risk.

4) ISAR (applied originality source from ISAR) consists of 7 items = full scored = 14:100.

5) TRST (applied originality source from TRST) consists of 9 items = full scored = 18:100.

On the ISAR and TRST, all items were rated on a 2-point summative response scale scored by rating, and the interpretation used the same values scored scaling of HRB. The RRST was calculated and improved in the 2nd draft of the RRST.

Validity

The IOC was used to evaluate the RRST = 0.936, mean = 49, and SD = 13.360 as a 2nd draft of RRST.

Reliability

Cronbach's alpha coefficient examined the internal consistency reliability. The Cronbach's coefficient alpha was computed for the total scales and each sub-scale of the new tool. An acceptable coefficient was 0.70 or greater [23]. In general, correlation ranging from 0.30 to 0.50 (−0.30 to −0.50) is considered low positive/negative; correlation ranging from 0.50 to 0.70 (−0.50 to −0.70) is moderate positive/negative; and correlation ranging from 0.70 to 0.90 (−0.70 to −0.90) considered high positive/negative. A correlation above 0.90 is considered very high [24]. The RRST scored had coefficient correlation = 0.72; it indicated the RRST scored measure had a slightly high level of tool reliability in specific time and space [25].

To develop the RRST, the researchers examined 4 patients' records and individual reports using the RRST screening score classified into 8 categories for contrast and comparison of each case's features, including clinical characteristics before discharge home, as shown in **Table 1**.

Table 1 The 4 selected cases of elderly stroke patients using RRST before discharge to home classified by each crucial clinical aspect of the case reported individually.

1. Patient Information

Case/characteristics	Age	Sex	status	Education	Income US$/ year	Occupation	Family
Case no. 1	61	male	single	Secondary school	n/a	monk	n/a
Case no. 2	80	female	married	Primary school	2,883	Unemployed	Living with husband/wife grandchildren and relatives
Case no. 3	80	female	married	Secondary school	2,883	Unemployed	Living with husband/wife and children
Case no. 4	75	female	married	Primary school	2,523	Unemployed	Living with husband/wife and children

2. Clinical Presentation

Case/characteristics	Diagnosis	Duration of Illness	Chief Complaint
Case no. 1	Ischemic Stroke	17* days	Weak left hand and leg 2.07 h. PTA
Case no. 2	Ischemic Stroke	14* days	Ataxia 2 days PTA (before admitted)
Case no. 3	Ischemic Stroke	8* days	Weak right hand and leg, dysarthria 2 days PTA
Case no. 4	Ischemic Stroke	7* days	Weak left hand and leg, dysarthria 2 days PTA

3. Diagnostic assessment

Case/characteristics	Sign/symptoms	Past History	NIHSS Scored
Case no. 1	2.07 h. PTA while eating, then Buddhist monk felt weak left side (left hemiparesis), facial weakness (minor left facial weakness), severe dysarthria, alert and good consciousness, no numbness.	Diabetes, Hypertension, Ischemic-Heart Disease status; post coronary-artery-bypass surgery (CABG), Chronic-kidney disease (CKD).	11*
Case no. 2	Two days PTA feeling vertigo, ataxia but can stand, no weakness, good verbal ability, no facial palsy. Today, at noon felt dysarthria, ataxia, cannot stand, blurred vision in both eyes.	unknown underlying, social alcohol drinking, no smoking	4*
Case no. 3	Two days PTA, weak right hand and leg, dysarthria, alert and good consciousness, no numbness.	Diabetes, Hypertension, and chronic kidney disease (CKD).	11*
Case no. 4	Two days PTA (last seen 9 pm - March 15, 2019, had a normal sleep) relatively weak left hand and leg (left hemiparesis), dysarthria, left facial palsy, alert, less content of consciousness, and followed 1 step command.	Type 2 Diabetes, Hypertension, and Dyslipidemia.	14*

4. Diagnostic examination

Case/characteristics	MRI	Computed Tomography Angiography (CTA)	Echo
Case no. 1	Restrictive diffusion at right pons.	Old hypo-dense lesion at right frontal lobe, and hyper-dense lesion at pons and stenosis of the M1 part of the right MCA basilar aneurysm.	Severely impair LV systolic function, EF 25 %, no intracardiac thrombosis.

Case no. 2	No	Hypo-density at right pons, remote lacunar infraction at the left lentiform nucleus, and posterior limb of the bilateral internal capsule.	No
Case no. 3	No	Hypo-density lesion at left pons.	No
Case no. 4	No	Hypo-dense lesion of the right subcortical white matter and right periventricular, old hypo-density at the right occipital.	Good EF, good LV and RV systolic function, no intracardiac clot.

5. Clinical Characteristics

Case/characteristics	Vital Signs	Body Mass index (BMI) kg/m^2
Case no. 1	Temp = 37 ºC, Pulse = 100/min, RR = 22/min, BP = 142/80* mmHg (standard BP ≤ 130/80 mmHg) BW = 72 kg, HT = 170/cm^2	24.9*
Case no. 2	Temp = 36.6 ºC, Pulse = 64/min, RR = 12/min, BP = 149/70* mmHg (standard BP ≤ 130/80 mmHg) BW = 57 kg, HT = 164/cm^2	21.3
Case no. 3	Temp = 37.7 ºC, Pulse = 100/min, RR = 20/min, BP = 170/80* mmHg (standard BP ≤ 130/80 mmHg) BW = 65 kg, HT = 164/cm^2	24.2*
Case no. 4	Temp = 37 ºC, Pulse = 84/min, RR = 22/min, BP = 151/86* mmHg (standard BP ≤ 130/80 mmHg) BW = 74 kg, HT = 162/cm^2	28.2*

6. Laboratory Results

Case/characteristics	Total Cholesterol: TC	Fasting Blood Sugar: FBS	Renal Function Test: RFT	Liver Function Test: LFT	Complete Blood Count: CBC	International Normalized Ratio: INR
Case no. 1	HDL = 55 mg/dl, LDL = 106 mg/dl, Cholesterol = 189 mg/dl, Triglycerides = 130 mg/dl	FBS = 177 mg/dl, HbA1C = 7.1 %	BUN = 55.8 mg/dl, Creatinine = 3.34 mg/dl	AST (SGOT) = 20 U/L, ALT (SGPT) = 22 U/L, ALP (Alk. Phosphatase) = 78 U/L, Total protein = 7.5 g/dl, Albumin = 3.4 g/dl, Globulin = 4.1 g/dl, Total bilirubin = 0.56 mg%, Direct bilirubin = 0.25 mg%	Hematocrit (Hct) = 41.8 %, Hemoglobin (Hb) = 13.7 g/dl, Platelet count = 280,000/L	Prothrombin Time (PT) = 12.4 s, Activated Partial Thromboplastin Time (aPPT) = 26.1 s, International Normalized Ratio (INR) = 1.02
Case no. 2	HDL = 63 mg/dl, LDL = 127 mg/dl, Cholesterol = 211 mg/dl, Triglycerides = 96 mg/dl	FBS = 102 mg/dl, HbA1C = 5.03 %	BUN = 15.11 mg/dl, Creatinine = 0.97 mg/dl	AST (SGOT) = 32 U/L, ALT (SGPT) = 26 U/L, ALP (Alk. Phosphatase) = 124 U/L, Total protein = 6.5 g/dl, Albumin = 3.3 g/dl, Globulin = 3.2 g/dl, Total bilirubin = 0.49 mg%, Direct bilirubin = 0.12 mg%	Hematocrit (Hct) = 37.0 %, Hemoglobin (Hb) = 11.8 g/dl, Platelet count = 322,000/L	Prothrombin Time (PT) = 12.0 s, Activated Partial Thromboplastin Time (aPPT) = 24.7 s, International Normalized Ratio (INR) = 0.98
Case no. 3	HDL = 50 mg/dl, LDL	FBS = 185	BUN = 27.03 mg/dl,	AST (SGOT) = 29 U/L, ALT (SGPT) =	Hematocrit (Hct) = 34.7 %,	Prothrombin Time (PT) = 12.9 s,

Case/characteristics						
	= 46 mg/dl, Cholesterol = 109 mg/dl, Triglycerides = 64 mg/dl	mg/dl, HbA1C = 6.6 %	Creatinine = 1.94 mg/dl	18 U/L, ALP (Alk. Phosphatase) = 49 U/L, Total protein = 7.6 g/dl, Albumin = 2.9 g/dl, Globulin = 4.7 g/dl, Total bilirubin = 0.64 mg%, Direct bilirubin = 0.33 mg%	Hemoglobin (Hb) = 11.2 g/dl, Platelet count = 222,000/L	Activated Partial Thromboplastin Time (aPPT) = 24.0 s, International Normalized Ratio (INR) = 1.06
Case no. 4	HDL = 33 mg/dl, LDL = 66 mg/dl, Cholesterol = 121 mg/dl, Triglycerides = 140 mg/dl	FBS = 118 mg/dl, HbA1C = 7.2 %	BUN = 5 mg/dl, Creatinine = 0.67 mg/dl	AST (SGOT) = 18 U/L, ALT (SGPT) = 12 U/L, ALP (Alk. Phosphatase) = 37 U/L, Total protein = 6.5 g/dl, Albumin = 3.2 g/dl, Globulin = 3.3 g/dl, Total bilirubin = 0.13 mg%, Direct bilirubin = 0.22 mg%	Hematocrit (Hct) = 34.7 %, Hemoglobin (Hb) = 11.7 g/dl, Platelet count = 255,000/L	Prothrombin Time (PT) = 13.4 s, Activated Partial Thromboplastin Time (aPPT) = 26.8 s, International Normalized Ratio (INR) = 1.1

7. Treatment

Case/characteristics	Drug	Drug Type
Case no. 1	Aspirin (325 mg) oral OD, Aspirin (81 mg) oral OD, and Clopidogrel (75 mg) oral OD.	Dual antiplatelet drug
Case no. 2	Aspirin (325 mg) oral OD.	Antiplatelet drug
Case no. 3	Clopidogrel (75 mg) oral OD and Enoxaparin 0.6 cc SC OD	Antiplatelet drug
Case no. 4	Aspirin (325 mg) oral OD.	Antiplatelet drug

Table 2 The risk screening before discharge to home classified by each crucial clinical aspect of the cases reported individually.

Risk Screening before Discharge Home						
Case/characteristics	ADL Scored	IADL Scored	HRB Scored	TRST Scored	ISAR Scored	Total score
Case no. 1	10*	1*	13	2*	5*	31
Case no. 2	20*	1*	13	1*	4*	39
Case no. 3	15*	1*	10	2*	5*	33
Case no. 4	15*	1*	9	2*	4*	29

Note: * = High-risk score. The value is lower or higher than the reference value/Reference; ISO 15189 from Bureau of Laboratory 28 Quality Standards, Department of medical science, Ministry of Public Health.

Concerning risk screening before discharge to home, the ADL assesses problems with daily living, walking, movement, and eating. Among those, Case no.1 had a problem with defecation and urinary elimination. Regarding BMI kg/m^2, all 4 cases were overweigh (above standard) and had high Blood Pressure (except Case no. 3).

According to the laboratory examination, all cases (except Case no. 2) had a high level of HbA1C (above the standard). Some of them had high BUN and Creatinine (above the standard). For CBC, they had a lower Hematocrit and Hemoglobin level, also Albumin. Cases no. 1, 3 and 4 had Diabetes Mellitus, Hypertension, and CKD as underlying diseases. The IADL factor was insufficient in all instances with HRB, ISAR, and HRST rated high risk combined with a long stay of hospital utilization.

Discussion

This study reviewed 14 research studies to summarize the validity, reliability, and predictive ability of 5 RRST used in older adults with stroke. The studies had moderate to relatively large sample sizes. Most of the tools were used in a hospital context but varied by hospital site and patient population. ISAR is a quick and easy screening tool widely used in the ED and acute care units. Moreover, the TRST was able to predict readmission as well. The HOSPITAL score, was a valuable predictor of hospital readmission for older adults, while RRAT was primarily geared toward patients in a high-risk group. Lastly, the LACE index is designed to quantify the risk of early death or unplanned readmission.

Tool's validity and reliability are vital in developing and testing a screening tool [26]. Validity for all 5 screening tools was reported in the past and was similar in the low-to-moderate range.

The variables most often incorporated as predictors in the tools were patient-oriented, such as cognitive and memory problems (8 studies); both the need for help and difficulties in walking (8 studies); and length of stay and comorbid conditions (4 studies). A large proportion of the tools included organizational predictors such as an extended stay of hospital admission history (12 studies) and polypharmacy (8 studies). The tools identified are only part of the intervention for attempting to prevent readmission. These should be a part of a system evaluation that will include organizational and system-level change for detecting multiple risks [27].

The present study employed a systematic review methodology and case report to accommodate data gathering in the health and medical sciences that enabled the significance of its findings. Strong evidence for good practice should be analyzed and synthesized by relevant stakeholder experts. It brings about strong tool development with improved adherence to obtain the most significant benefit from healthcare services; moreover, the quality of the tool must ensure applicability and efficacy. This design includes the selected case reports reflecting tool quality for content and construct validity. Case reports with case comparisons across 4 cases shared common traits of hospital readmission for stroke in elderly patients as a predictive goal of this phase. Comparative case studies involve analyzing and synthesizing the similarities, differences, and patterns, which leads to hospital readmission among the elderly with stroke.

Predictivity of RRST quality is attained if the high-risk group is identified correctly and which factors are of 'causal attribution' or 'casual contribution'. Comparative case studies covering 2 or more cases produce more generalizable knowledge about causal questions and a need to understand and explain how features within the context influence program or policy initiatives' success. Based on our results, continually monitoring lipids' alterations in 4 stroke elderly patients with concomitant 3 diseases appear extremely important on hospital readmission in 28 days [28]. In addition, a high risk ADL score shows that daily living activity needs should be managed carefully by counseling, raising perceived risk in daily eating, proper exercise, permanently reducing stress and medication adherence. The findings from case studies showed excessively long hospital stay indexes; case reports ranged from 7 - 17 days. Biomarker risks such as dyslipidemia's, arrhythmias, and anemia are a warning sign of hospital readmission of elderly stroke patients, increasing the mortality rate in Thailand [29]. This is an emerging concern not widely recognized in previous studies. Progressive increases in cholesterol may also be considered a marker of reversal of critical illness and patient recovery. Still, increasing cholesterol may induce or worsen underlying atherosclerotic cardiovascular diseases, stroke, or myocardial infarctions.

Conclusions

The RRST development is a crucial quality step in ensuring the achievement of intended quality outcomes. It is increasingly recognized that design should use systematic reviews, and be reorganized, criticized, and synthesized by crucial expertise in academic health sectors and health care services. Moreover, the 4 case reports reflect practicability, efficacy, and reliability for validity of prediction. The development of the RRST was achieved through research procedures required by a regulatory protocol for clinical practice. These standard guidelines will contribute to preparing a well-designed tool for clinical practice.

This study has some limitations. Evidence provided was limited by the small number of studies targeting older persons' stroke readmission in the same hospital over 28 days. Also, studies did not

consider patients' career/work circumstances as a limitation on multiple risk prevention measures at home. Little work has been done in severe cases, especially regarding medical adherence practice and health outcome, including the acceptability of non-pharmacological approaches or alternative medicines using traditional cures.

Given the need for readmission screening of the elderly, we suggest researchers and healthcare workers providing stroke care use the tools we have reviewed in hospital readmission risk screening to plan for more effective healthcare services for elderly patients with stroke.

Acknowledgments

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