



Potential solutions for screening, triage, and severity scoring of suspected COVID-19 positive patients in low-resource settings: A scoping review

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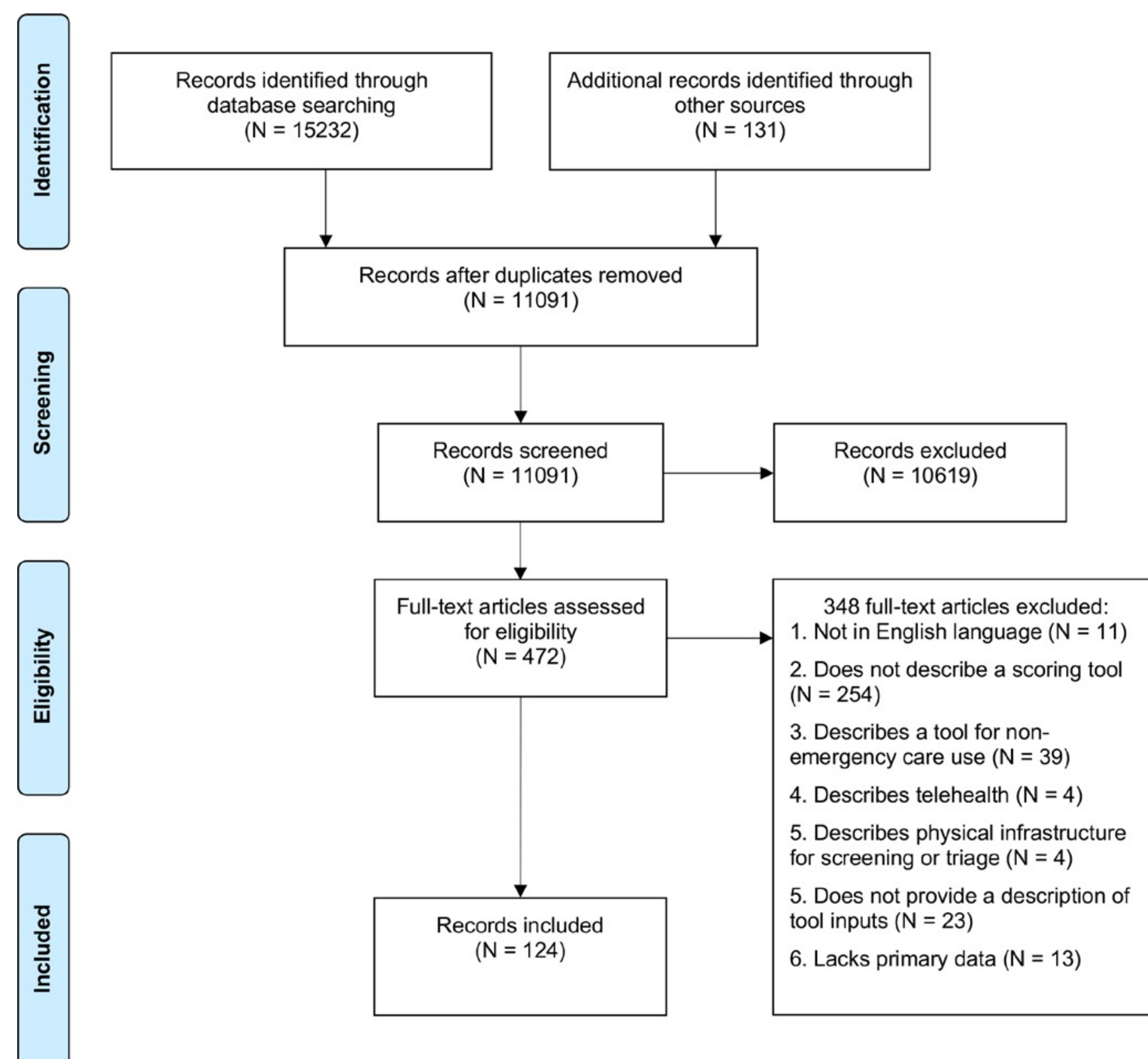
BACKGROUND AND AIM

While many low- and middle-income countries were relatively spared from high COVID mortality rates, public health measures to contain the virus have put enormous strains on health systems and the ability of countries to care for existing disease burdens.(1) Early recognition and treatment of acute conditions are integral to reducing general mortality in low resource settings (LRS).(2) Previous evidence suggests three specific processes - screening, triage, and severity scoring of patients - improve patient outcomes in LRS. (3) The need for screening, triage, and severity scoring tools in real-time may lead to the use of both unvalidated and potentially ineffective protocols. We aimed to identify proposed and/or implemented methods of screening, triaging, and severity scoring suspected COVID-19 patients upon initial presentation to the healthcare system. We also aimed to evaluate the utility of these tools in LRS.

METHODS

A systematic search was conducted to identify literature published between 01 December, 2019 and 01 April, 2020 describing screening, triage, and severity scoring practices that have been implemented or proposed for use with suspected COVID-19 patients upon first presentation to emergency or acute care settings. Relevant data was extracted from eligible texts, including:

- year of publication, country and setting in which the tool was proposed or implemented
- status of the tool as proposed or implemented
- any tool inputs (e.g. comorbidities, clinical symptoms and findings, and diagnostic and laboratory results).



OUTCOMES

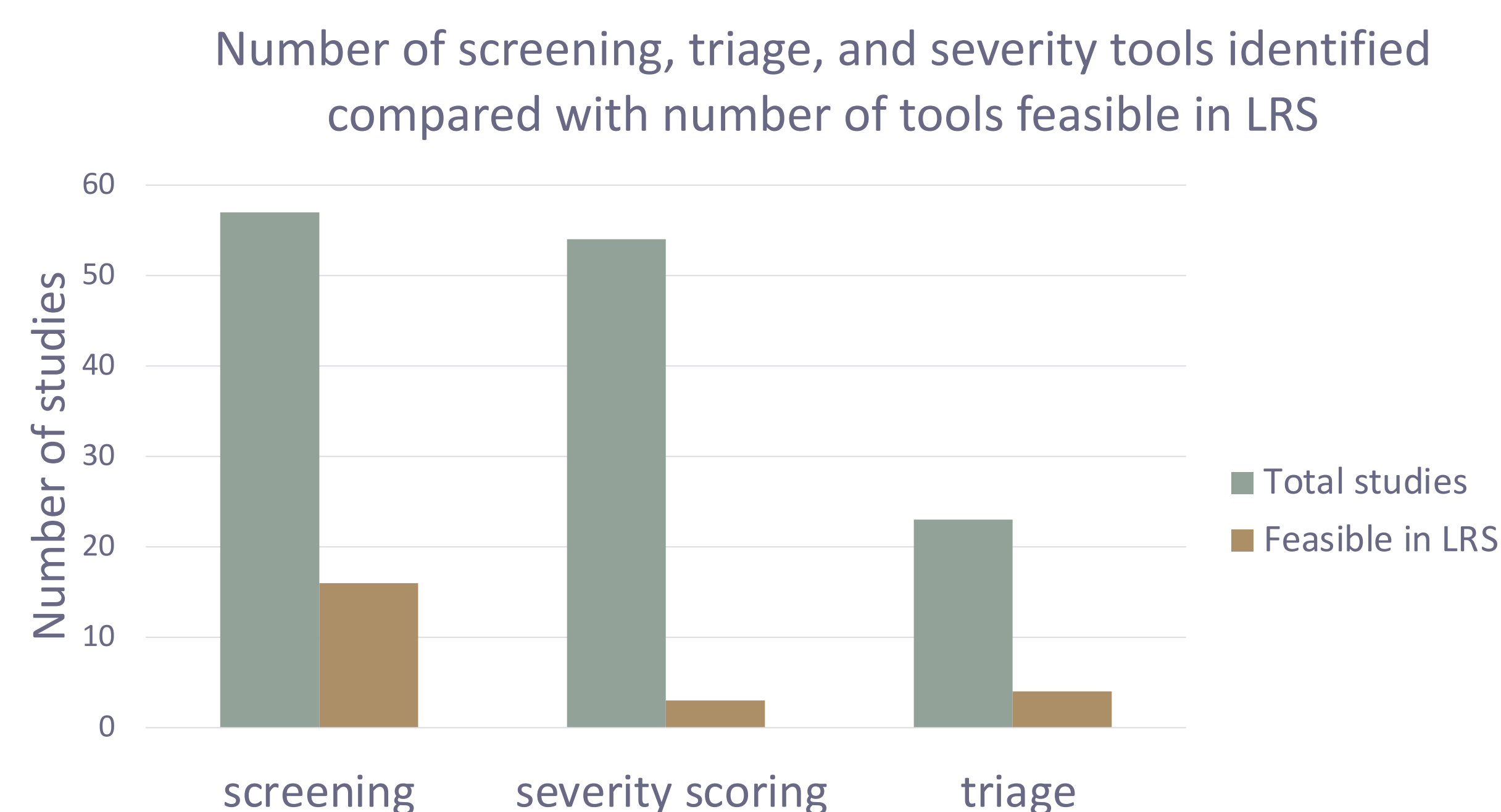
Full-text review resulted in 124 articles for full inclusion and data extraction Articles originated from 27 countries; with the majority published or conducted in China (n=41, 33-1%), followed by the United States (n=23, 18-5%) and Italy (n=10, 8-1%). International recommendations were described in three articles (2-4%).

Table 2 Overview of inputs in tools used to screen, triage and evaluate the severity of patients with COVID-19

	Screening tools (n=57)		Triage tools (n=23)		Severity scoring tools* (n=54)	
	No. unique inputs	%	No. unique inputs	%	No. unique inputs	%
Total combined inputs†	76	100.0	108	100.0	116	100.0
Clinical interventions received	0	0.0	5	4.6	1	0.9
Comorbid conditions	6	7.9	15	13.9	24	20.7
Concurrent acute conditions	2	2.6	14	13.0	9	7.8
Demographics	2	2.6	4	3.7	7	6.0
Imaging investigations	3	3.9	3	2.8	3	2.6
Laboratory investigations	22	28.9	32	29.6	42	36.2
Other characteristics	3	3.9	4	3.7	2	1.7
Signs and symptoms	28	36.8	16	14.8	11	9.5
Vital signs	10	13.2	15	13.9	17	14.7

*The total number of tools (n=134) does not equal the total number of papers (n=124), as some papers reported on more than one tool. †Per cents are out of the total combine inputs, not the number of tools.

More than one quarter of tools (n=37, 27-6%) provided validation data supporting their use, with four (3-0%) validated prospectively. Only four screening tools (7-0%) and two triage tools (8-7%) had associated validation data, while 29 severity scoring tools (53-7%) did. All of these tools were validated in high-income (n=18, 48-6%) or upper-middle-income (n=19, 51-4%) country settings. Of those validated in upper-middle-income countries, 16 were validated in China (84-2%), two in Turkey (10-5%), and one in Mexico (5-3%). Screening tools had a median of four (IQR: 3-7) inputs. Most (n=36, 63-2%) included epidemiologic risk factors. Fever was commonly included as a reported symptom (n=31, 54-4%) or a measured vital sign (n=17, 29-8%). Triage tools had a median of eight (IQR: 2-5-13-5) inputs. Oxygen saturation was the vital sign most commonly used (n=22, 16-4%), followed by tachypnoea (n=20, 14-9%). Concurrently diagnosed acute conditions were present in multiple triage tools (n=6, 26-1%). Severity scoring tools had a median of five inputs (IQR: 1-8-5). The most frequently used inputs in these tools were age (n=22, 40-1%), lactate dehydrogenase (n=11, 20-4%), respiratory rate (n=7, 37-0%), and temperature (n=5, 9-3%).



Tool inputs that rely on imaging and nearly all laboratory testing are largely impractical for routine use in many frontline EUs in LRS.(7, 8) Screening tools were proposed or implemented in six LMICs - 19 in China, two in India, and one each in Mexico, Timor-Leste, Turkey, and Uganda. Of the 58 tools proposed for use in LMICs, only 23 -16 for screening, four for triage, and three for severity scoring - were deemed feasible in LRS.

DISCUSSION

Most of screening tools found in this review recommended conducting screening on patients using epidemiologic risk factors and symptoms consistent with the case definition of suspected COVID-19, such as cough and fever. Non-validated use of such tools could be problematic for multiple reasons. Firstly, it is well documented that there is poor, inaccurate self-reporting of epidemiologic risk factors, including exposure to other patients and travel history.(4) Compounding this is the fact that a substantial portion of COVID-19 cases present atypically, without the commonplace symptoms that providers are screening for using these tools (5). For example, one study of 1099 confirmed COVID-19 cases demonstrated that only 43.8% of COVID-19 positive cases presented with fever.(6)

The general lack of tools, specifically those for severity scoring, has led to the development of a contextually-appropriate COVID-19 mortality scale for LRSs. (7) Though not included in this study due to initial search parameters, the AFEM-CMS is a pragmatic tool which makes use of seven demographic, historical, and clinical inputs to evaluate potential risk of death in COVID-19 patients; a second tool includes pulse oximetry.

Limitations: This review is likely missing a number of tools. Almost every health system worldwide maintains some form of screening and triage processes, along with processes for further decision-making around admission. Risk of bias assessments could not be performed because most articles were in the form of descriptive reviews, rather than presentations of primary data.

CONCLUSION

In LRS, where definitive diagnostic tests for COVID-19, such as RT-PCR, may not be available, screening, triage, and severity scoring of potential COVID-19 patients are critical. Rapid identification and prognostication of suspected COVID-19 patients in LRS EUs will allow for appropriate precautions and care to be rendered to all patients, resulting in conservation of resources and reductions in morbidity and mortality. At present, no screening, triage, or severity scoring tools have been designed and validated specifically for LRS. In the face of an enduring pandemic, it is critical that such tools be developed, validated, and made available, so that limited resources can be conserved for those in greatest need and unnecessary loss of life is prevented.

FUNDING AND CONFLICTS OF INTEREST

No funding was received for this study. There are no competing interest for any author.

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