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AI triage support in Swedish primary health-care: A scoping review

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Abstract

Background: Ageing populations, amid shortages of primary care workers, pose a challenge in meeting future health care demands. Artificial intelligence (AI) has been proposed as a means of reducing delays and improving resource allocation. This scoping review explores the current state of knowledge regarding AI-triage in Swedish primary care.

Method: A systematic database search, as described by Arksey O'Malley, was conducted in PubMed and Embase, where papers not relating to a Swedish primary care setting were excluded.

Result: Five reports were included, of which three were based on semi-structured interviews with primary care stake holders. A fourth article compared AI and practitioner triage retrospectively, while the fifth constituted an expert opinion. All included studies suggested that AI holds promise for triage in primary care, either as a means of reducing workload or by enhancing triage quality or efficiency. However, issues with systems integration put current efficiency into question. Concerns about risk aversion, practitioner deskilling and biases against disadvantaged populations were identified, as well as a lack of methodological standards for evaluating AI-triage technology in general.

Conclusion: AI has potential use in a primary care triage setting, but current obstacles in terms of insufficient evidence, a lack of standards for evaluation and challenges with its implementation in practice, including how to handle possible implications for patients and health care workers, have to be overcome.

1 Background

The World Health Organization expects an increase in the global shortage of health workers from 7.2 million in 2013 to 12.9 million by 2035 (1, 2). Although the shortage of skilled health professionals is unequally distributed throughout the world, with Sub-Saharan Africa considered to be the most affected region, accounting for 25% of the global disease burden, while having only 3% of the health workers of the world, the ageing populations of Europe and North America keep increasing the demand of health care there (1).

Sweden stands out as having one of the highest densities of physicians per capita in Europe, at 0.44% , but does not manage to reach the goal set by the National Board of Health and Welfare (Socialstyrelsen) concerning primary health care specialist density of 0.091% at a current level of 0.068% (3, 4). Socialstyrelsen identifies a shortage of registered nurses, and forecasts a continued shortage in all regions of Sweden by 2040. Furthermore, Socialstyrelsen finds that it will be challenging to meet future health care demands. Finally, it considers high accessibility as an important part of healthcare and expects primary healthcare to treat a larger fraction of patients.

Artificial intelligence (AI) has been identified as "one of the most transformative developments in modern medicine" with potential to reduce delays and to improve resource allocation (5). Moreover, AI could potentially improve accuracy and efficiency in an emergency department setting, and has promising results in reducing documentation time.

Meyer et al. (6) found that AI could function as an "augmentation tool" helping with diagnostics, documentation and communication, in the emergency department, but raised concerns regarding reliability in "critical scenarios" where serious consequences can be incurred by even the smallest errors. Further research was deemed essential to evaluate its performance in clinical settings.

In a 2023 review, Riboli-Sasco et al. (2) examined research on "Online symtom checkers" (OSC), i.e. digital tools that suggest possible diagnoses and recommendations based on users' responses to structured online questionnaires, and reported inconsistent evidence regarding their diagnostic accuracy. Despite this limitation, the authors noted that OSCs hold substantial potential for improving patient access to preliminary triage recommendations.

Triage refers to the process of supplying "effective and prioritized care to patients while optimizing resource usage and timing", which originated from the needs of the French army to sort wounded soldiers, during the Napoleonic wars (7). The first civilian interpretation was implemented in hospitals in 1964. Today, there are different types of algorithms that e.g. combine patient vital parameters into a score or color code of urgency. Robertson-Steel (8) argues that the objective of an effective triage system in the 21st century remains "meeting the challenges of demand management and gate keeping, and focusing limited resources on those most at need".

There is an ongoing digitalisation of primary care in Sweden, with an increase in digital approaches (9). At the same time there is a "lack of a gold standard for triage", with multiple pathways for patients to access primary healthcare, such as via telephone, video or digital self service. Either at the primary care facility or via a nurse staffed national call center (10).

Thus, considering the increasing demand of health care (1), and current shortage of skilled health workers (4), it could be expected that AI might offset some of the resources needed in triage and assist in increasing accessibility for patients with the greatest medical needs (2, 5, 6). However, there are claims that the speed at which AI-solutions are integrated into general practice outpaces available evidence (11), which warrants further investigation.

1.1 Aim

To explore current research regarding AI triage in a primary care setting in Sweden.

2 Method

2.1 Study design

A scoping review, as described by Arksey and O'Malley (12), was conducted to identify current knowledge on the subject matter. In scoping reviews, in contrast to systematic reviews, the quality of found articles is not assessed. To better outline the question at hand, the following PCC-model was used

P	–	Population	:	All patients.
$\mathbf{C}_1$	–	Concept	:	Artificial intelligence$_1$ triage support$_2$.
$\mathbf{C}_2$	–	Context	:	Swedish primary care.

2.2 Search strategy

To conduct a systematic search in multiple databases, the ideal search set S_i was designed to reflect the model, by creating an intersection of three presumably partly overlapping ideal sets *Artificial Intelligence* $\subset C_{1,1}$, *Triage* $\subset C_{1,2}$ and *Primary Care* $\subset C_2$, all not at all contained within a fourth ideally exclusionary set E of possible primary care settings within fields not studied here, such as e.g. odontology, emergency room care or veterinary medicine.

$$S_i = C_{1,1} \cap C_{1,2} \cap C_2 \setminus E, \tag{1}$$

which in practice, after consulting with librarians at the Biomedical Library at University of Gothenburg, was converted into the following corresponding MeSH search string spanning all fields

$$\mathrm{S} = \mathrm{C}_{1,1}\ \textbf{AND}\ \mathrm{C}_{1,2}\ \textbf{AND}\ \mathrm{C}_2\ \textbf{NOT}\ \mathrm{E}\ .$$

Where

$\mathrm{C}_{1,1}$ = (Artificial Intelligence
OR Expert Systems
OR Machine Learning
OR Large Language Models
OR "Artificial Neural Network")

$\mathrm{C}_{1,2}$ = Triage

C_2 = (General Practice
OR Primary Health Care
OR "Primary Care")

E = (Emergency Service, Hospital
OR Dentistry
OR Veterinary Medicine)

Of note is that the MeSH-terms; Expert Systems, Machine Learning and Large Language Models are subsets of the broader MeSH-term Artificial Intelligence.

However, since recent articles may lack MeSH-indexation, the subsets were explicitly included to allow for the inclusion of their respective keywords. *PubMed* and *Embase* search engines were used to provide a setting with a health care population context **P** as specified by the PCC-model. The search was conducted on the 20th of March 2026.

2.2.1 Study selection

Firstly, the result of the search was imported into reference handling open source software Zotero version 8.0.4, after which doublets were excluded. As a secondary step, the titles of the remaining articles were reviewed by the author according to the established inclusion and exclusion criteria. Following this, the abstracts of still included articles were reviewed. Finally, the articles were read in their entirety, and included or excluded according to the inclusion and exclusion criteria.

Inclusion criteria : All publications that corresponded to the PCC-model outlined previously, including all types of AI and by any definition .

Exclusion criteria : Emergency department, dentistry applications or publications without full text access were excluded, as well as articles not concerning Swedish conditions.

2.3 *Ethical considerations*

This study reviews existing literature and does not involve research on biological material or human participants, nor does it process any personal data. It is considered to be exempt from formal ethical approval.

3 Results

A total of 384 search results were identified through PubMed and Embase, of which 83 were identified as duplicates. After screening the titles of the remaining 301 an additional 173 entries were excluded, of which a further 117 were removed after reviewing their abstracts. Articles sought for retrieval amounted to 56, of which five could not be retrieved in full, and therefore excluded. Of the remaining 51 articles, 46 met the previously established exclusion criteria of not concerning specifically a Swedish healthcare perspective, and were excluded. A total of five articles published between 2020 and 2025 were included, as per figure 1.

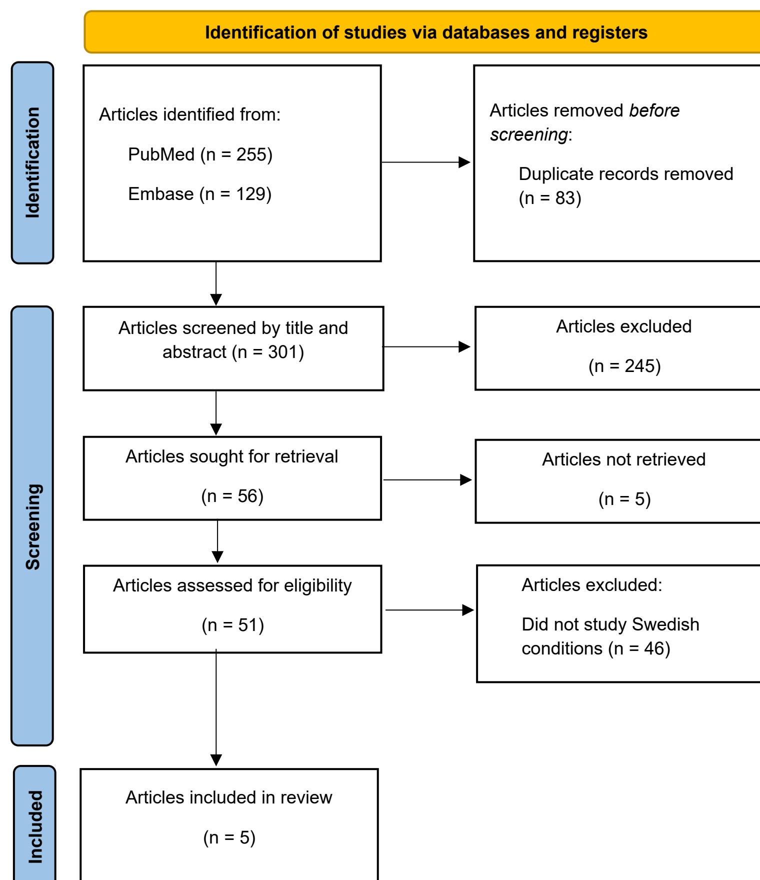

Figure 1: PRISMA flowchart of the search. (13)

Table 1: Overview of included articles.

Study	Design	Population	Purpose	Primary outcomes	Key Findings	Conclusions
Entezarjou et al. (14) (2020), "Human-Versus Machine Learning-Based Triage Using Digitalized Patient Histories in Primary Care: Comparative Study"	Retrospective comparative study	300 medical history reports in an online primary care platform.	Compares interrater reliablity between physicians and three machine learning models.	Classification agreement, Cohen κ between a naïve Bayesian model and physician majority vote triage.	Interrater reliability in human triage (Cohen κ 0.2) and between the panel and the model (Cohen κ 0.17).	Finds low interrater and intrarater agreement in physicians, meaning inconsistent physician triage, which limits human triage as reference for AI[1] triage in primary care.
Larsson et al. (15) (2025), "Integrating AI-based triage in primary care: a qualitative study of Swedish healthcare professional's experiences applying normalization process theory"	Semi-structured interview study	8 physicians, 3 registered nurses, 2 psychologists and 1 social worker, across 2 primary care centers in southern Sweden	Exploring the experiences of using a AI-based[1] triage application among primary healthcare providers.	Categorizes interview data through pre-determined constructs specified by normalization process theory.	Insufficient initial information hindered understanding and meaningful engagement. Tool use optionality hindered development of a "community of practice". Providers relied on patients free text messages rather than AI[1] summaries. Providers questioned the usefulness of the AI[1] tool.	Insufficient organizational support led to only partial integration of the AI[1] application, despite acceptance among health care providers. Uncertainties concerning usefulness, equitable access for patients and effectiveness.
Nymberg (11) (2025), "AI in primary care - a general practitioner's bucket list. An EGPRN Keynote Paper from May 2025 Gothenburg"	Comment Article	N/A	Emphasising the importance of evidence-based tools, and to discuss needs and challenges of medical staff.	Weighing potential benefits against potential harms.	Decision support, triage, administrative support as potential benefits. Overdiagnosis, alert fatigue, increased clinical burden, environmental damage and data leakage or poisoning, as potential harms.	Identifies need for interdisciplinary research to gain evidence, as well as dedicated guidelines and protocols.
Siira et al. (16) (2024), "Healthcare leaders' experiences of implementing artificial intelligence for medical history-taking and triage in Swedish primary care: an interview study"	Semi-structured interview study	13 healthcare leaders across 7 primary care centers in 3 Swedish regions.	To explore the experiences of primary care leaders who implemented an AI[1] application for triage, specifically concerning encountered barriers and the actions taken to overcome them.	Categorization through a thematic analysis of barriers, later linked to actions to navigate them.	Three barrier themes identified: 1) Healthcare profession-related, such as resistance and skepticism. 2) Organization-related such as adapting the organization to digital care. 3) Technology-related such as insufficient application functionality and integration. Actions included involving the care givers, guiding patients and improving the application.	Underscores the importance of a holistic approach for successful integration of AI[1] and the role of empirical research.
Steerling et al. (17) (2025), "Influences on trust in the use of AI-based triage-an interview study with primary healthcare professionals and patients in Sweden"	Semi-structured interview study	8 physicians, 3 registered nurses, 2 psychologists and 1 social worker, across 2 primary care centers in southern Sweden.	To explore influences on trust of primary care workers and patients in the context of AI[1] based triage.	Categorizes interview data through a reflexive thematic analysis.	Three themes on trust in the context of AI[1] triage were found: 1) Accurate patient information. 2) Clinical expertise alignment. 3) Supervision of health and safety.	Emphasizes the importance of user competence, dialogue between users and of institutional trustworthiness. Users need clear guidelines and instructions to handle uncertainties.

[1] Artificial Intelligence

3.1 Article characteristics

Among the five articles included, as described in table 1, a total of three qualitative semi-structured interview based studies exploring AI-triage experiences were found (15, 16, 17). A fourth study retrospectively compared triage of primary care physicians to that of a machine learning algorithm (14). The fifth paper was based on a keynote lecture discussing the needs and challenges of primary care medical staff in the context of AI (11). All articles that studied patients had ethical approval.

3.2 Synthesis

All studies referred to the idea that AI holds promise for triage in primary care, either as a means to reduce workload (14, 15, 16) or by enhancing triage quality or efficiency (11, 17).

In this respect, three studies reported issues with systems integration as a barrier to workload reduction and efficiency. Siira et al. (16), utilizing a thematic analysis of semi-structured interview data, concluded that the AI-based triage application of interest was not fully integrated into a primary care setting. Healthcare leaders experienced that additional work was caused by patients seeking care not only through the AI-based triage application, but also doubly via conventional means. Concerns were raised of AI not being integrated with the medical record system. Similarly, Larsson et al. (15) using a theoretical framework based on normalization process theory, reported that health care professionals experienced challenges with systems integration, such as a lack of organizational support and routines. Finally, Nymberg (11) highlighted the complexity of handling multiple channels of patient inflows, and that a lack of integration between the medical record and the triage platforms increased the administrative burden.

While Larsson et al. (15) found that providers experienced that triage summaries could save time, time was still needed to review the output, which put time-effectiveness into question. Experience of overwhelming and not always relevant lists of differential diagnoses by AI-based triage applications was reported. In this context, Siira et al. (16) found that leaders perceived that providers preferred reading free text messages of patients, rather than the AI reports and that time had to be spent guiding patients through the application. Overly cautious triage decisions, or risk aversion, leading to unnecessary patient

consultations were mentioned as well. However, healthcare leaders still preferred to use the technology as it was instead of waiting for a perfect system, while arguing that the technology should augment, not replace, existing practices.

Furthermore, several studies discussed triage accuracy and trust. Problems with patients who did not provide enough information or who exaggerated symptoms, and in prioritizing patients with pre-existing conditions, were identified by Siira et al. (16). Similarly Steerling et al. (17), using an approach based on a reflexive thematic analysis, found that patients could ignore AI-based triage application questions if they experienced them as irrelevant, and identified a risk of patients being dishonest. Patients raised concerns regarding proper storage of data, which could affect their comfort in providing information. In this perspective, Entezarjou et al. (14) mentioned a finding of lower adherence in patients to follow symtom checker recommendations than from a triage nurse. Steerling et al. (17) identified trust as essential to the efficiency of AI-systems, while Siira et al. (16) speculated that providers may trust their own judgement more than AI output.

Four studies highlighted potential risks with AI technology. The risk of deskilling was identified by Steerling et al. (17). Nymberg (11) believed there to be potential harm in "overdiagnosis, alert fatigue, increased clinical burden, environmental damage, data leakage or poisoning". Health care leaders identified barriers in terms of professional scepticism, patients and professionals adapting to digital care (16). Moreover, Larsson et al. (15) suggested that patients with low digital literacy, low level of writing skills or impaired psychological or cognitive capacities were perceived to be disadvantaged. Simultaneously physicians were worried about AI applications influencing patients wrongly which could cause conflicts when the AI and the practitioner did not agree (17).

Going forward, Nymberg (11) described a lack of available evidence for efficacy or safety of AI-applications. A research gap regarding comparisons with traditional telephone triage and studies of adherence to recommended care, was identified. Entezarjou et al. (14) identified a low human interrater and intrarater triage agreement, which further "limits the possibility to use human decisions as a reference" for automating primary care triage. Finally, Nymberg (11) called for the need of creating a methodological framework for evaluating large language models in primary care, and that there needs to be agreement on standards for evaluation. Interdisciplinary collaboration of e.g. computer scientists, primary care researchers, policy makers is considered important.

4 Discussion

The systematic process behind this scoping review identified five studies that covered aspects of AI triage in a Swedish primary care setting. No systematic reviews, observational studies or RCTs were identified. The majority of studies were qualitative, studying relatively small populations, published by partly the same researchers. Specifically, Steerling et al. (17) and Larsson et al. (15) had identical population compositions which could imply identical study populations. In general, there appears to be a lack of evidence, and the findings of the included articles mostly serve as bases for hypotheses.

4.1 Strengths and limitations

The strength of this study lies in its systematic approach to finding relevant literature through two large representative databases, but is limited by the relatively small amount of included articles. Furthermore, articles were actively excluded through the search term, which could exclude a set of relevant articles containing specific keywords, which is a limitation. It is possible that the inclusion of more databases would have rendered more results, and possibly less bias favouring English language journals indexed in specifically a North American and European context. However, the selection at hand was eventually deemed to be within the scope of this study of Swedish conditions.

There is no question about AI technology being a rapidly changing field. Models like ChatGPT are dynamic, release new versions multiple times a year. Research findings tend to vary depending on publication year and model version studied, with a trend seemingly favouring accuracy. However, as seen in this study, accuracy is far from the only parameter of interest in AI triage research. All but one study included were published in the span 2024-2025, which is to be considered as recent, but which still may not represent the state of the field, in practice, at the time of writing in 2026.

The results of the study published in 2020 by Entezarjou et al. (14), despite being the least recent, still highlights persisting methodological problems in evaluating triage with a human reference. A limitation in all other studies is that the amount of participants is relatively small ranging from 1 to 14, and tied to a relatively narrow area geographically while studying implementations of AI triage in a primarily qualitative manner.

Moreover, it has to be mentioned that five articles were not retrieved in full, of which none, after a secondary review of abstracts and titles, would have been included in the final study due to fulfilling exclusion criteria of not studying a Swedish perspective. However, most likely international studies would have been generalizable to Swedish conditions, to some extent, but were eventually deemed out of scope for this study. Finally, a limitation lies in that articles, while guided by inclusion and exclusion criteria, have been selected solely at the author's own discretion, and read through the subjective lens of the author.

4.2 Generalizability

The lack of methodological frameworks mentioned by Nymberg (11) was similarly widely mentioned in international literature (2, 18, 19, 20). There was agreement that interdisciplinary collaboration is needed (11, 18, 19). Alamoudi et al. (21) believe that prospective designs, controlled interrupted time series or cluster randomized trials are indispensable for reliable safety evaluation, and propose frameworks for model assessment. Somewhat similar to the findings of Entezarjou et al. (14) , Ilicki (22) identifies an inherent difficulty in capturing important aspects of triage systems, and sees limitations with prevalent (in-silico) vignette studies. Kopka et al. (23) proposed the use of "Representative vignettes" from real cases, not unlike the approach used by Entezarjou et al. (14). Ilicki (22) mentions that AI is an evolving field where frequent software iterations might not provide a stable enough environment to study with RCTs and that there is a lack of consensus on what appropriate triage is, and how accuracy should be tested.

International in-silico vignette studies (21, 24, 25) point to the potential of AI technology, specifically finding high general AI triage performance, where large language models GPT 4o, Claude 3.5-Sonnet, Gemini 1.5 Pro performance was similar to that of primary care physicians (26).

The possibility of inherent inequities in AI technology was identified in the international literature as well. A Canadian interview study by Upshaw et al. (27) featuring patients, providers and health system leaders, as well as in a British study by Jones et al. (19) based on interviews with users and developers. While an Israeli study by Chalutz Ben-Gal et al. (18) mentioned that socio-demographic factors were not significant predictors of readiness to use AI-based technology in primary care during the corona virus pandemic, a study by Arellano et. al (28) in a US specific web-based symtom checker, found

that most of their users were middle-age to young females and highly educated, illustrating a digital divide, in practice. Furthermore, a vignette study by Inan et al. (29) found socio-economic biases in ChatGPT 5.2. Another vignette study by Omar et al. (30) found that large language models treated tone as clinical input altering triage, which could allocate more resources to patients writing in urgent or forceful language.

Risk aversion or overly cautious triage decisions, as mentioned by Larsson et al. (15) was identified in a number of international studies (19, 31, 32). Furthermore, the risk of deskilling, as covered by Steerling et al. (17), was similarly identified in multiple foreign sources (19, 27, 33). The importance of routine and supervision, as mentioned by Siira et al. (16) and Steerling et al. (17), or generally a lack thereof, could lead to performance drift or degradation over time as demographics, language and risk profiles or hardware shifts and may worsen existing health inequities according to studies by Alamoudi et al. (21) and Jones et al. (19).

As described previously, the results of the included articles seem to be consistent with findings in international literature (2, 18, 19, 20, 27, 31, 32, 33). While primary care may look different and face specific challenges depending on its implementation through various health care systems, the described problem areas, should likely hold on a more general level throughout space and foreseeable time for most digitalized primary care settings.

4.3 Practical implications

This study shows the current state of AI triage in Swedish primary care as an imperfect work in progress. It outlines some challenges in a more general systems perspective, which is a first step to overcoming them, to better make technology serve society, particularly patients and workers, going forward, rather than ensnaring them.

4.4 Future research directions

A general lack of quantitative studies on AI-based triage systems, in a Swedish context, has been identified. This may partly be explained by the novelty and rapid development of the field; however, as highlighted previously, there are also unresolved questions regarding appropriate research methodologies. Agreed upon methodological frameworks and standards are currently lacking. Although

some proposals have been described in the international literature (21, 23), their applicability to Swedish conditions remains to be explored. Furthermore, studies addressing the potential system-wide implications of AI triage, as well as how to ensure equitable health care based on need, are also scarce. These gaps represent important directions for future research.

5 Conclusion

All in all, AI has potential use in a primary care triage setting. However, current obstacles in terms of insufficient evidence, a lack of standards for evaluation and challenges with its implementation in practice, including how to handle possible implications for patients and health care workers, have to be overcome.

Conflicts of interest

The author has no conflicts of interest to declare.

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