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Positive predictive value of Dutch Elder Abuse Scale (ERASE): an early warning tool for elder abuse in the emergency department and geriatric outpatient setting

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Abstract

Background Elder abuse (EA) is a worldwide problem with serious consequences for individuals and society. This study aimed to determine the prevalence of EA and positive predictive value (PPV) of the Dutch Elder Abuse Scale (ERASE), an early warning tool for EA in patients presenting to the emergency department (ED) or geriatric outpatient clinic (GOC) in hospitals in the Netherlands.

Methods Three general peripheral hospitals in the Netherlands participated. The study population were subsequent patients aged 70 years and older who visited the ED or GOC. Healthcare professionals (nurses/physicians) working at the hospital's ED and GOC administered ERASE. In case of suspected EA, the case was assessed in a standardized manner in the EA multidisciplinary team meeting (EA-MDTM) by independent experts. This assessment was considered the reference test. All data were quantitatively descriptively analyzed. To test ERASE for its performance in clinical practice, the PPV was determined. Also the prevalence of EA in the (acute) hospital setting was determined.

Results In the inclusion period 22924 patients aged 70 years and older visited the ED or GOC. In almost half of these patients ERASE was administered by healthcare professionals of the three hospitals. In total 202 (1.8% (95% CI: [1.5%; 2.0%])) patients had a positive score on ERASE and were subsequently discussed in the EA-MDTM. In total 54 patients were concluded to have been a victim of EA according to the EA-MDTM. The total prevalence of EA in patients aged 70 years and older, visiting the ED or GOC, based on the conclusion of the EA-MDTM of the hospital working group on domestic violence, was 0.5% (95% CI: [0.35%; 0.62%]). The PPV of ERASE was 28% (95% CI: [0.20%; 0.35%]).

Conclusions Although the PPV of ERASE was not high, the tool may help detect signs of EA in the ED or GOC. Subsequently further investigation is required to substantiate or reject the diagnosis of EA. An EA-MDTM where a case is discussed in a standardized manner can aid in that perspective.

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Keywords Elder abuse, Prevalence, Positive predictive value

Background

Elder abuse (EA) is a worldwide problem with serious consequences. Older people can become victims of abuse by someone they know and whom they depend on, such as family, friends or professional caregivers. EA is not always intentional, sometimes it is due to care falling short. It is associated with increased psychological stress, morbidity and mortality and increased use of healthcare resources, especially emergency services [1–4]. There are different forms of EA, such as financial, physical and psychological abuse. A systematic review by Yon et al. [5], included studies of 28 countries and estimated a pooled prevalence rate for overall EA in the community of 15.7% in people aged ≥ 60 years and older. In the Netherlands a study found a prevalence of EA of 5.5% since the age of 65, and 2.0% in the past year. This means that approximately 1 in 20 older adults have experienced EA at some point since turning 65, and about 1 in 50 becomes a victim each year [6]. Findings from a study in 2022 [7] also suggested a potential increase in the severity of EA during COVID-19. However, adequate awareness and knowledge of EA among healthcare professionals, such as nurses and physicians, is not yet common, and recognition remains complex [8–12]. Admission and treatment of an older person to (acute) hospital settings such as an emergency department (ED) or the geriatric outpatient clinic (GOC) can be a window of opportunity, where victim and perpetrator can no longer hide the signs of abuse. In the Netherlands, a GOC is a specialized outpatient clinic in the hospital that focuses on the care of older adults. Unlike a general primary care clinic, it provides comprehensive assessment services tailored to the unique needs of older patients. The team includes a geriatrician, nurse specialist, psychologist, physiotherapist, and social worker. The goal is to evaluate complex health issues—such as cognitive decline, frailty or polypharmacy—in an integrated way, after which findings and recommendations are shared with the referring physician. Patients have a separate primary care physician as well.

Healthcare professionals in the (acute) hospital setting may be the first to recognize EA or receive signals of abusive or neglectful situations from emergency medical technicians and can subsequently intervene or refer to the appropriate authorities [9, 13, 14]. To effectively deal with EA, a systematic approach is necessary. A specific warning tool for EA for use in the Dutch hospital setting, the Dutch Elder Abuse Scale (ERASE), has been developed to increase awareness and give guidance to the healthcare professional to detect possible signs of EA (see supplement 1) [15]. The ERASE tool is administered as a prescreener during the beginning of the first

clinical encounter. The ERASE tool is incorporated in the Electronic Medical Record (EMR) and applied in patients aged 70 years and older. It begins with an awareness (starting) question, prompting professionals to articulate their gut feelings/clinical gestalt. If the answer on this question yields a “yes” or “doubt” (possible). Doubt was added as a third response option—used when the assessor is uncertain or when signs are ambiguous. It then guides the professional through six (signalling) questions to gather information on observed signs and symptoms of EA and neglect. A feasibility study demonstrated that the ERASE tool enhances healthcare professionals’ ability to recognize EA. It was also deemed acceptable and appropriate for use in the ED setting [15]. However, the lack of research into the clinimetric characteristics of the ERASE tool motivated this study.

Methods

Aim, study design and participants

The aim of this prospective cohort study was to test the positive predictive value (PPV) of the ERASE tool and furthermore, to describe the prevalence of EA in the ED and GOC. For research into the performance of the ERASE tool (the index test), the standardized assessment of cases by independent experts in a multidisciplinary team meeting on EA (the EA-MDTM) was applied as reference test.

Three general peripheral hospitals in the Netherlands (H1, H2, and H3) were invited to participate. The hospitals were located in the East, South and North of the Netherlands and had 700, 800 and 600 beds respectively. We selected the ED and the GOC of these hospitals as the focus of our study because vulnerable elderly patients in the Netherlands frequently utilize these services when they come to the hospital, based on urgency and convenience. The target audience of this study consisted of healthcare professionals working in the ED and GOC. The study population included patients aged 70 years and older who visited the ED or the GOC, whether they had cognitive problems (e.g. dementia) or not. Patients who had multiple scheduled consultations at the GOC during the study period were only included at their first consultation.

Data collection

All three hospitals provided anonymous data on all patients who visited the ED and GOC from May 2021 to January 2022. The data were retrieved from the electronic patient records of the hospitals and exported into an Excel file. Data collection was fully integrated into the hospital care pathways. Identifying EA using the ERASE

tool during assessments at the ED or GOC was already part of regular care in the three hospitals.

Data from the index test (ERASE scores) were collected for all patients aged 70 years and older and included the outcome on the ERASE tool (defined as positive or negative according to previous definitions) and, in case of a positive outcome, answers to the (signalling) questions of the ERASE tool. The data from the reference test were also collected in the secure digital research environment. Additionally, several patient characteristics were collected from the EMR. These data included age, sex, and date of hospital visit, as well as the referrer, medical specialty, and destination after the visit to the ED or GOC. The triage code was also incorporated into the data. Depending on the hospital, either the Manchester Triage System (MTS) or the Netherlands Triage Standard (NTS) was used for triage. The MTS is a five-level ED triage system which assigns an urgency level based on the patient's signs and symptoms. The urgency levels are divided into red (immediate), orange (very urgent), yellow (urgent), green (standard), blue (non-urgent). The NTS is a Dutch triage standard used by EDs, general practice centers and ambulance control rooms. It is a six-level system describing urgency levels from U0 (resuscitation) to U5 (no risk of harm, next workday) based on the patient's condition [16–18].

All patients received a unique study number that was linked to their unique patient number via a code list. The assessment form of the reference test also contained the unique study number per patient. Each hospital designated one project group member who held the key to this linkage between patient number and study number. The data on patient characteristics and the index test were anonymized from the EMR and uploaded by the hospital directly into the secure digital research environment. The final decision after the EA-MDTM on the reference test was also anonymously delivered to the study team, together with sex, age, and date of hospital visit, and was added to the final database. This variable could be added to the database by matching cases on sex, age, and date of hospital visit. The data on patient characteristics, index test, and reference test were linked by an independent project advisor and epidemiologist from the project team in the digital research environment using the study number. This linkage took place at the end of the inclusion period. The researchers (MvH, SAAB, RLMB) received an anonymous file for data analysis.

Outcome measures

Healthcare professionals (nurses or physicians) working at the hospital's ED and GOC administered the awareness question from the ERASE tool in all patients aged 70 years and older. Patients were recruited 24/7, during days, nights, and weekends. If the ERASE tool indicated a

positive result (yes or doubt on the awareness question), the case was scheduled for discussion in the monthly EA-MDTM. The patient was informed of this by the treating nurse or physician.

The EA-MDTM of the hospital working group on domestic violence/EA consisted in every hospital of at least a clinical geriatrician, an emergency physician, the local officer on EA/domestic violence, a geriatric nurse and a social worker from Adult Protective Services. The discussion in the EA-MDTM as follow-up step to a positive score on the ERASE tool was part of regular care in the three participating hospitals and was subject to the Medical Treatment Contracts Act or in Dutch WGBO. This aligned with the fact that, in their daily work, the experts in the EA-MDTM regularly determined whether EA was present or not. A chair, either a medical specialist or the local officer on EA/domestic violence, was appointed to monitor time, lead the discussion, and guide the decision-making process. The local officer on EA/domestic violence prepared the case for the EA-MDTM using a Standard Preparation List. Cases were presented anonymously in accordance with the General Data Protection Regulation (GDPR) by the healthcare professional who identified the case or the local officer on EA/domestic violence. The EA-MDTM determined the presence of EA through a majority decision process guided by a Standard Operating Procedure. If an expert in the meeting had a treatment relationship with the patient or the suspected perpetrator, they did not participate in the decision-making process for that case. It was determined whether EA was present, and if so, type(s) of abuse, and observed signals were identified. Based on the decision-making outcome, necessary actions were summarized by the chair at the end of each case discussion. The outcome of the EA-MDTM was recorded in the EMR.

Sample

Each month, about 550 older people aged 70 years and older are seen at the ED of Hospital 1, 700 at the ED of Hospital 2, and 550 at the ED of Hospital 3. This means that in the three hospitals 1800 older people are seen in the ED per month. For the GOCs, this involves in total 24 new consultations with patients aged 70 years and older per month. The prevalence of EA in older people visiting hospitals in the Netherlands is unknown, but based on previous research [6], an estimate is that 1 out of every 50 older people living at home are victims annually. To examine the PPV of ERASE, a sufficient number of older people were needed in the study. To calculate the sample size, we used the sensitivity calculation according to Hajian-Tilaki [19] where the sensitivity was set at 0.8 with a confidence interval (CI) of 0.1. We chose a conservative prevalence estimate of 1% in the calculation, as the actual prevalence in hospitalized patients is unclear. According

to this calculation, the sample should consist of at least 6,146 patients. In order to have ample patients in the study, an inclusion period of 9 months was chosen.

Data analysis

A statistician/methodologist contributed to the conceptualization and design of the study. The data analysis was performed by the PhD student (MVH) under supervision of an experienced epidemiologist (RLMB) and professor (SAAB). All data were quantitatively descriptively analyzed. Descriptive continuous data were summarized as mean (standard deviation (SD)) or median (interquartile range (IQR)), depending on level of normality. The authors tested for normality using the Shapiro-Wilk test. Relative frequencies were calculated for nominal variables. For the data on prevalence, CIs were calculated using the Clopper-Pearson method [20]. To test ERASE for its performance in clinical practice, the PPV was determined. The PPV means the probability that patients with a positive ERASE screening truly are diagnosed with EA in the EA-MDTM. Therefore, the PPV of ERASE was calculated by the ratio (and 95% CI) of patients truly diagnosed as positive with EA according to the EA-MDTM results and all those who had positive (yes or doubt) ERASE test results at the ED or GOC. Due to study design, sensitivity and specificity could not be determined, as patients with negative ERASE results were not evaluated by the EA-MDTM. Missing data were accurately noted. Analyses were conducted with complete cases. Data were analyzed using SPSS (IBM Corp. Released 2013. IBM SPSS Statistics for Windows, Version 25. IBM Corporation, Armonk, NY, USA).

Results

Database and prevalence

In the inclusion period 22,924 patients aged 70 years and older visited the ED or GOC. In 49.9% of these patients the ERASE tool was administered by healthcare professionals of the three hospitals (see Fig. 1). In total 202 (1.8% (95% CI: [1.5%; 2.0%])) patients had a positive score on ERASE and were subsequently discussed in the EA-MDTM. In total 54 patients were concluded to have been a victim of EA according to the EA-MDTM. The total prevalence of EA in patients aged 70 years and older, visiting the ED or GOC, based on the conclusion of the EA-MDTM, was 0.5% (95% CI: [0.3%; 0.6%]).

Characteristics of patients and the consultations

Of the patients aged 70 years and older who were screened for ERASE on the ED or GOC, 6071 (53.1%) were female. Their median age was 79.0 years (IQR=74.0–85.0). See Table 1. Most patients were referred to the ED and by their general practitioner, see Table 3 Appendix 1. Most relevant specialties visited

were general surgery (31.5%), internal medicine (15.6%), and neurology (13.8%). Most patients had a (moderate) urgent indication for help. More than half of the patients (51.9%) was admitted to the hospital after the consultation on the ED or GOC, see Table 4 Appendix 2.

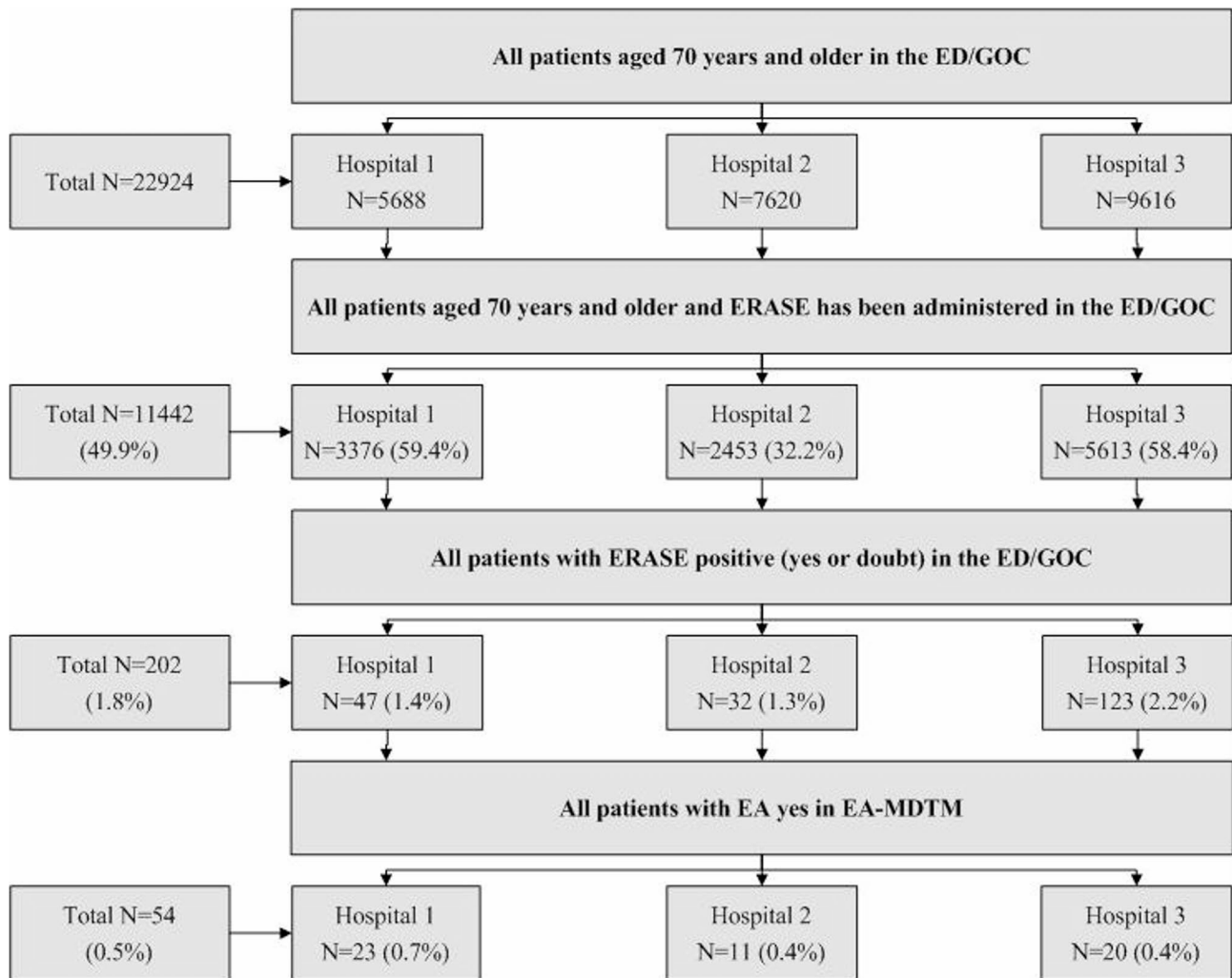
Performance of ERASE

The PPV for a positive result on the ERASE tool on the ED/GOC was 28% (95% CI: 20%–35%). The PPV of the three hospitals differed between 13% and 54% (see Table 2).

Discussion

The aim of this study was to evaluate the performance of the ERASE tool in clinical practice by determining its Positive Predictive Value (PPV). Additionally, we explored the characteristics of patient visits and calculated the prevalence of EA. We found that the PPV of ERASE was 28% across the three hospitals. More than half of the patients were female, with a median age of 79 years. Most patients were referred to the hospital by their general practitioner. The total prevalence of EA in patients aged 70 years and older, visiting the ED or GOC, based on the conclusions of the EA-MDTM, was 0.5%.

When comparing our findings with existing literature on screening instruments for EA in hospital settings, the identified rate of EA in the study on the Elder Assessment Instrument (EAI) by Fulmer et al. [21] (5% out of 180 patients) was higher than the prevalence of EA in our study (0.5% out of 11,442 patients). However, Fulmer's study specifically focused on neglect, and patients had to meet multiple eligibility criteria to be included, which may have induced selection bias. The PPV of the EAI was not studied. In the study by Platts-Mills et al. [22] on the ED Senior AID tool, the identified rate of EA was also higher (7% out of 259 patients) compared to the prevalence of EA in our study, and the PPV of the ED Senior AID tool was 39%. However, the assessor's overall judgment was used as the reference test, which could have created incorporation bias. In our study, the standardized assessment by independent experts in the EA-MDTM was used as the reference test for identifying EA. Although both studies reported a higher prevalence of EA, there was an apparent pre-selection of patients in both studies, while the ERASE tool enlisted all patients aged 70 years and older who visited the ED or GOC. The ERASE tool is therefore more generalizable and can be seen as a pre-identifier. Furthermore, both instruments contained a longer list of questions, making their use less suitable in an ED setting. The ERASE tool does not specify a fixed period (e.g., past year) for the occurrence of elder abuse. Instead, it was designed to identify current concerns or signs that may indicate ongoing or recent mistreatment, based on clinical observation and



EA: elder abuse, EA-MDTM: multidisciplinary team meeting on elder abuse

Fig. 1 Number of patients presented and administration ERASE on the emergency department (ED) or geriatric outpatient clinic (GOC)

Table 1 Characteristics of patients and the consultation, sex, age, entry department (N= 11442)

	Total		Hospital 1		Hospital 2		Hospital 3	
	N	%	N	%	N	%	N	%
Sex (female)	6071	53.1	1790	53.0	1209	49.3	3072	54.7
Age in years (median, IQR)	79.0	74.0–85.0	79.0	74.0–84.0	79.0	75.0–85.0	80.0	75.0–85.0
Entry department	10,144	88.7	3158	93.5	2453	100.0	4533	80.8
	ED		ED		ED		ED	
	1298	11.3	218	6.5	n.a.	n.a.	1080	19.2
	GOC		GOC			GOC		GOC

IQR interquartile range; n.a not applicable, ED emergency department, GOC geriatric outpatient clinic

patient interaction. This may partly explain the difference in prevalence compared to studies using a defined retrospective time frame, such as past-year occurrence. ERASE was designed for another purpose, namely early warning. For example, in the ED Senior AID tool a six-month retrospective period was used for the elder abuse

questions. The EAI instrument did not define a specific time frame and was based on clinical impressions and observed indicators. To explain the low PPV observed, we considered several factors: Firstly, approximately half of the eligible patients were administered the ERASE tool, and this incomplete administration may have introduced

Table 2 Positive predictive value of ERASE tool on EA according to EA-MDTM results

		Result ERASE ED/GOC	Result EA-MDTM	PPV (CI)
		Yes		
Total	yes	144	40	0.28 (0.20–0.35)
	yes/doubt	198	52	0.26 (0.20–0.32)
Hospital 1	yes	35	19	0.54 (0.38–0.71)
	yes/doubt	45	23	0.51 (0.37–0.66)
Hospital 2	yes	30	11	0.37 (0.19–0.54)
Hospital 3	yes	79	10	0.13 (0.05–0.20)
	yes/doubt	123	18	0.15 (0.08–0.21)

ED emergency department, GOC geriatric outpatient clinic, Result EA-MDTM multidisciplinary team meeting on elder abuse, PPV positive predictive value, CI confidence interval

selection bias, affecting the PPV. Secondly, the study was conducted during the COVID-19 pandemic, which probably resulted in a relevant number of missings. Thirdly, we included positive or doubt ERASE test results in the denominator for PPV. Typically, PPV is only based on clearly positive test results. Potentially, this might have resulted in an overestimation of cases of EA in the denominator for the PPV calculation. From this perspective, the measured PPV in this study could be an underestimation of the true PPV. As the denominator decreases, and the nominator remains equal, then the true value of the PPV becomes higher. Lastly, variations in the local implementation of agreements and differing levels of experience with EA screening across hospitals may have impacted the results.

Implementing an effective warning tool for EA is important, but it is equally important to provide advice and guidance on what to do when EA is suspected, to support healthcare professionals in addressing this challenging issue [23]. Detecting EA in the hospital setting has thus far been scarcely examined and is not yet common clinical practice in the hospital setting in the Netherlands, unlike in child abuse (CA) [24]. Even instruments developed to screen for CA have shown to have a low PPV, comparable with ERASE, albeit with a high negative predictive value [25]. Professionals should realize that a positive screening is still a long way from a diagnosis of CA or EA. Further investigation of abuse and discussing a case in a standardized manner, for example in a multidisciplinary setting as demonstrated in this study, is therefore almost always required to substantiate or reject the diagnosis of EA [26]. Despite the low PPV, we believe that the ERASE tool creates awareness and knowledge about EA among healthcare professionals in hospitals, by subsequently discussing cases in a structured EA-MDTM setting.

Strengths and limitations

A strength of this study is that it was prospectively executed, following normal clinical practice extended with an EA-MDTM. Furthermore, we designed this study so that we were able to answer our research questions without the need for collecting privacy-sensitive information from patients or proxies. A limitation of this study was that there was no check on patients with a negative ERASE outcome, and selection bias might have occurred because not all eligible patients were screened. The patients included in the study could have differed systematically from the general population of interest, leading to a systematic error in outcome. A possible explanation for the number of patients not screened is that the investigation took place during the COVID-19 pandemic. Also, no screening may have taken place when a professional found the chance of EA occurring too low for raising any gut feeling/clinical gestalt. We also showed differences in performance between the different hospitals. More experience with the topic in two out of three hospitals that already screened for EA for a longer time may have made the gut feeling/clinical gestalt question more discriminating there. No investigation was conducted regarding the possible presence of cognitive impairment in the patients, which could be considered a limitation. The ERASE tool is administered by professionals rather than filled out by the patients themselves. This is actually one of the strengths of the tool, as it enables professionals to recognize signs of abuse even if the patient has difficulty communicating due to, for example, cognitive impairment. Although cognitive impairment may affect communication, it does not inherently prevent a patient from providing a credible account of abuse. In the study by Wigglesworth et al. (2009), eight participants in the abused group with MMSE scores of less than 24 (range 16–23) who were not represented by surrogates provided credible statements reporting inflicted bruises, and two reported accidental falls [27]. Further research is needed on the preservation of memory for emotional events despite mild to moderate cognitive impairment. Furthermore, because of the lack of privacy-sensitive information, we were not able to calculate more conditional probabilities, such as the negative predictive value, as we only had data of positive ERASE on the ED/GOC. Still, the PPV showed a small CI suggesting an adequate precision and reliability.

Conclusions

This is the first prospective study on the performance of ERASE in three general peripheral hospitals in the Netherlands. Although the study showed the ERASE tool had limited PPV, the tool may help create awareness and knowledge on EA by stimulating subsequent professional discussion on cases in a structured EA-MDTM setting.

The ERASE tool is highly relevant for use by nurses and physicians (both geriatric and emergency) as an early warning instrument. It supports timely identification of patients at risk, enabling proactive intervention and improved care coordination. Its integration into daily clinical practice can enhance multidisciplinary communication and decision-making, particularly in acute and geriatric care settings, because of the large elderly population in these settings.

Appendix 1

Appendix 1 Characteristics of patients and the referrer (N=11442)

		Total		Hospital 1		Hospital 2		Hospital 3	
		N	%	N	%	N	%	N	%
Referrer	Ambulance*	2247	19.6	108	3.2	669	27.3	1470	26.2
	other hospital	11	0.1	2	0.1	0	0.0	9	0.2
	check after first consultation	29	0.3	0	0.0	0	0.0	29	0.5
	self-referral	1424	12.4	889	26.3	106	4.3	429	7.6
	general practitioner	5267	46.0	2081	61.6	1196	48.8	1990	35.5
	Outpatient clinic/hospital department	960	8.4	235	7.0	176	7.2	549	9.8
	care facility	106	0.9	57	1.7	0	0.0	49	0.9
	unknown	1084	9.5	3	0.1	1	0.0	1080	19.2
	other	314	2.7	1	0.0	305	12.4	8	0.1

*Ambulance including transfer from care facility (pertaining to all 3 hospitals)

Appendix 2

Appendix 2 Characteristics of patients and the consultation, responsible physician, triage codes and destination after emergency department (ED) or geriatric outpatient clinic (GOC) (N=11442)

		Hospital 1		Hospital 2		Hospital 3	
		N	%	N	%	N	%
Responsible specialism	anesthesiology	1	0.0	0	0.0	0	0.0
	cardiology	379	3.3	108	3.2	78	3.2
	general surgery	3607	31.5	888	26.3	574	23.4
	geriatrics	963	8.4	217	6.4	329	13.4
	dermatology	5	0.0	0	0.0	2	0.1

Appendix 2 Characteristics of patients and the consultation, responsible physician, triage codes and destination after emergency department (ED) or geriatric outpatient clinic (GOC) (N=11442)

		Hospital 1		Hospital 2		Hospital 3		
		N	%	N	%	N	%	
Responsible physician	gynaecology/obstetrics	5	0.0	3	0.1	1	0.0	
	ear nose throat	60	0.5	24	0.7	15	0.6	
	pulmonology/lung diseases	835	7.3	493	1.6	233	9.5	
	gastroenterology	684	6.0	233	6.9	164	6.7	
	neurology	1576	13.8	353	10.5	404	16.5	
	ophthalmology	6	0.1	1	0.0	0	0.0	
	orthopedics	344	3.0	147	4.4	131	5.3	
	plastic surgery	26	0.2	3	0.1	18	0.7	
	rheumatology	3	0.0	0	0.0	1	0.0	
	urology	564	4.9	146	4.3	150	6.1	
	internal medicine	1783	15.6	732	21.7	352	14.3	
	oncology	1	0.0	0	0.0	1	0.0	
	unknown	569	5.0	0	0.0	0	0.0	
	other	31	0.3	28	0.8	0	0.0	
	Manchester triage code	U5-blue	39	0.3	39	1.2	n.a.	n.a.
		U4-green	911	8.0	911	27.0	n.a.	n.a.
		U3-yellow	1219	10.7	1219	36.1	n.a.	n.a.
		U2-orange	922	8.1	922	27.3	n.a.	n.a.
U1-red		45	0.4	45	1.3	n.a.	n.a.	
missing		8306	72.6	240	7.1	n.a.	n.a.	
NTS triage code		U5-grey	134	1.2	n.a.	n.a.	108	4.4
		U4-blue	199	1.7	n.a.	n.a.	102	4.2
		U3-green	3649	31.9	n.a.	n.a.	760	31.0
		U2-yellow	2760	24.1	n.a.	n.a.	969	39.5
	U1-orange	784	6.9	n.a.	n.a.	484	19.7	
Destination after ED/GOC	U0-red	9	0.1	n.a.	n.a.	4	0.2	
	missing	3907	34.1	n.a.	n.a.	26	1.1	
	community dwelling	4755	41.6	1198	35.5	933	38.0	
						2624	46.7	

Appendix 2 Characteristics of patients and the consultation, responsible physician, triage codes and destination after emergency department (ED) or geriatric outpatient clinic (GOC) (N=11442)

	Hospital 1		Hospital 2		Hospital 3			
	N	%	N	%	N	%		
admittance to the hospital	5929	51.8	1941	57.5	1504	61.3	2484	44.3
deceased	10	0.1	6	0.2	4	0.2	0	0.0
other	20	0.2	7	0.2	12	0.5	1	0.0
missing	728	6.4	224	6.6	0	0.0	504	9.0

MTS = Manchester Triage System (U1 (red), immediate; U2 (orange), very urgent; U3 (yellow), urgent; U4 (green), standard; U5 (blue), non-urgent.); NTS = Nederlandse Triage Standaard, meaning Netherlands triage standard (U0 (red): critical; U1 (orange): very urgent; U2 (yellow): urgent cases; U3 (green): semi-urgent; U4 (blue): less urgent; U5 (grey): non-urgent) ED = emergency department; GOC = geriatric outpatient clinic; n.a. = not applicable

Supplementary Information

The online version contains supplementary material available at <https://doi.org/10.1186/s12877-025-06470-y>.

Supplementary Material 1.

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Authors' contributions

MvH contributed to the conceptualization, design, data collection and analysis, interpretation, and writing and editing of the manuscript. - RLMB contributed to the conceptualization, design, data collection and analysis, interpretation, and writing of the manuscript. - LCMV contributed to the funding acquisition, conceptualization, design, interpretation and reviewing of the manuscript. - MOR contributed to the conceptualization, design, interpretation and reviewing of the manuscript. - RA contributed to the conceptualization and design - BKB contributed to the conceptualization, design, data collection, interpretation, and reviewing of the manuscript. - KJIE contributed to the conceptualization, design, data collection, interpretation, and reviewing of the manuscript. - JL contributed to the conceptualization, design, data collection, interpretation, and reviewing of the manuscript. - YS contributed to the conceptualization, design, interpretation and reviewing of the manuscript. - SAAB contributed to the funding acquisition, supervision, conceptualization, design, data collection and analysis, interpretation and reviewing of the manuscript.

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Data availability

The data that support the findings of this study are available from the corresponding author, Miriam E. van Houten, upon request.

Declarations

Ethics approval and consent to participate

The study protocol was submitted for review by law to the institutional review board of the Radboud University Medical Centre. The review board ethically approved the study (authorization number: 2020–7252). All methods were performed in accordance with the relevant guidelines and regulations applicable to research with human subjects, such as the World Medical Association Declaration of Helsinki and the Medical research Involving Human Subjects Act. No informed consent from all subjects and/or their legal guardians(s) was deemed necessary by the institutional review board because the subjects did not have to do or abstain from something on behalf of the research. The study did not pose any additional (mental) risk for patients and was deemed normal good patient care.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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