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Characteristics and triage in older citizens calling a semi-acute medical helpline in Denmark: a prospective cohort study



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Abstract

Objectives To investigate baseline characteristics associated with older citizens calling the medical helpline 1813 (MH1813) in Denmark and how these baseline characteristics were associated with triage outcomes in a subset population of patients with high degree of worry (DOW).

Setting In the Capital Region of Denmark people with acute, non-life-threatening illnesses or injuries are triaged through a single-tier MH1813 for acute healthcare services.

Participants Participants were gathered from a prospective cohort established between 24 January and 9 February 2017 who called the MH1813. Out of 11,413 citizens, 1525 (13.3%) were elderly (≥ 65 years). Callers' identification, age, sex, and contact with general practitioner (GP) prior to MH1813-call were collected from the medical helpline's records. Data were enriched using the callers' self-rated health, self-evaluated DOW, and registry data on comorbidities.

Results Forty-two percent of call issues were terminated without any further action. Among 882 triaged to a hospital face-to-face consultation, n = 315 (36%) were admitted and 2/3 discharged directly from the emergency department. Approx. one third of the most worried older callers have had a contact with their GP prior to the MH1813 call. A high level on Charlson Comorbidity Index and high DOW significantly increased risk of admission. Adjusted self-rated health was not significantly associated with admission within the subset group of older self-callers and high DOW. Men more often than women, were referred to face-to-face consultation (46% vs. 37%) and subsequent admission (23% vs. 18%), though potentially explained by a higher comorbidity level in men.

Conclusion The MH1813 triage revealed that older callers were triaged to Face-to-face consultations if they had high DOW or were men representing a higher level of comorbidities than women. The patients' perspectives on being alone, loneliness, rejection of Face-to-face triage, and the re-transition dilemma, needs to be further investigated.

Keywords Single-tier telephone triage, Triage, Older, Acute health care services, Hospital admission

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Strength and limitations of this study

- This study is based upon "real-world" data from triage and voice logs from the Danish medical helpline
- Alternative solutions for elderly triaged to an ED need to be developed to avoid re-transitions of elderly citizens during acute illnesses
- The patients' perspectives on the re-transition phenomena of health care utilities need to be further investigated
- Although the dataset is from 2017, call volumes, referral patterns, and the helpline's organization have remained stable, supporting the validity of our findings

Introduction

Older people have an increased risk of acute admission due to multimorbidity [1], polypharmacia [2], decline in functional status [3], and account for 50% of all hospitalized medical patients [4]. Frequent diagnoses include heart diseases [5], pneumonia [6, 7], coronavirus infection (COVID- 19) [8], urinary tract infection [9], and fractures [10]. Timely initiated treatment is of prognostic importance [11, 12] though paradoxically, the complex interaction of polypharmacy and hospitalisation along with competing comorbidities increase the risk of and mortality [8, 13]. To meet the various needs for urgent health care among older citizens including unplanned acute admissions to medical emergency departments (ED), telephone triage is a widely used out-of-hours primary care function [14]. Telephone triage validity during the experience of worsened illness rely on client and call receiver communication [15]. Even that under-triage is considered low, the perception of illnesses is multi-symptomatic and inadequate symptom communication might influence triage outcome [16]. In the Capital Region of Denmark, people with acute, non-life-threatening illnesses or injuries are encouraged to call a single-tier telephone preadmission evaluation and triage service called Medical Helpline 1813 (MH1813) [17].

A recent Danish study MH1813 showed that patients provided more relevant information to judge admission necessity when they were asked about their degree-of-worry (DOW) [18]. Additionally, DOW has shown an association with illness perception, hospital admission, and health outcome [18, 19]. On a five-point scale, self-reported DOW of 4 or 5 was associated with a 5–6 times increased risk of acute hospitalization [20].

However, the interplay between DOW, acute illness, and triage for older citizens is far less unfolded. With a growing older population with comorbidities, investigating earliest phases of acute illness and triage is crucial to discuss the separation of those older in need of hospitalization from those better treated at home or in a primary care setting,—while taking their needs and situational circumstances into account. To illuminate how triage outcomes vary for this vulnerable group, we aimed to describe baseline characteristics associated with 1) older calling the MH1813 and 2) if these baseline characteristics were associated with triage outcomes in a subset population with high DOW (n = 364).

Design

The present investigation was designed as a prospective cohort study based on real life data from older citizens calling a single tier medical hotline in the Capital Region of Copenhagen, Denmark.

Methods

Settings

The acute care system within the Capital Region of Denmark, Copenhagen, offers two telephone numbers to the Emergency Medical Service: 112 for emergency calls and 1813 for less urgent calls [18].

Every year, 1 million calls are made to the MH1813. It is either nurses or physicians who triage the callers to selfcare, their own GP, clinic consultation at an emergency department, home visit, hospital admission, or dispatch of an ambulance. The Emergency Medical Service has developed an electronic triage tool to help guide the call handlers' responses [21].

Population

Inclusion criteria: The population for this study consisted of older citizens age \geq 65 years calling MH1813 for nonlife-threatening illnesses/injuries. Data were gathered from a prospective cohort established between 24 January and 9 February 2017. All patients calling MH1813 during this period were included, in case of several contacts, only the first call was used.

Exclusion criteria were refusal to participate, call by bystander (not relative or close friend), missing information on DOW and calls from persons without permanent Danish residency since they cannot be followed in registers.

Process

Data was based on acute calls to the medical helpline collected electronically using a message on the telephone while callers were waiting in line. Callers who agreed to participate were asked to state if they were the patient themselves or a relative/friend. Hereafter, callers were asked two questions. Firstly, to rate their DOW by answering the question: "How worried would you say you are about the situation you are calling about on a scale from 1 to 5, where 1 is minimal worry and 5 is maximum worry?" Secondly, to assess their self-rated health (SRH) on a five-point Likert scale ranging from 1: bad to 5: excellent. "How will you in overall rate your health"? The staff at MH1813 was blinded from the caller's answers on DOW and SRH during the triage process.

The triage response was categorized into three groups A, B or C based on the de facto triage outcome: *Group A*: Telephone consultation (self-care advice, referral to own GP, or self-refusers to emergency department consultation), *Group B*: face-to-face consultation (consultation at emergency department), *Group C*: face-to-face consultation and admission (direct hospital admission or admission after 48 h at the hospital).

Data sources and variables

Data was collected at four different time points, spanning from initial call to the triage outcome (Fig. 1).

Registration at MH1813

The internal data-registration had an incorporated triage tool where contact and patient related variables were registered. We collected information on caller characteristics (e.g. patient or relative), patient assessed DOW [18] and Self-rated Health [22], triage call handler (nurse vs. medical doctor), call handlers adjustment of patients' reason for calling, and triage response.

Danish National Patient Register [23] is a nationwide register that holds information on all in-hospital contacts including diagnoses and procedures since 1977 and emergency room and out-patient contacts since 1995. Information on date and time for hospital admission along with discharge and primary diagnosis were collected. Hospital admission was defined as hospital stay ≥ 24 h starting within 48 h after the call to the MH1813.

Comorbidity was estimated by the Charlson comorbidity index [24] including diagnoses for all hospital contacts up to 10 years before the call, and then grouped into no comorbidity (score 0), low co-morbidity (score 1), and moderate or high comorbidity (score 2+). Reason for calling was categorized as somatic illness, somatic injury, psychiatric illness, and other. Caller status was divided into the patient themselves or relative/friend.

Voice log analysis

Based on a thorough listening of the first 90 triage structured self-calls derived from the three triage response groups, explorative analysis with interpretation of voice logs was carried out by the first and last author until consensus. This was developed into a template to categorise and quantify the patient- and call handler communication in the total subset of patients with high DOW (n =364). The template consisted of seven factual categories established by the primary and the senior researcher. This subset exclusively incorporated patient self-callers to verify that telephone rated DOW represented the patients' and not their relatives' DOW.

Statistical methods

Data were analysed using SAS Enterprise Guide (version 7.12). The results are presented in frequency distribution (number and percentage).

Comparisons of variables were performed with crosstabulations and using Chi-square tests, where p-values < 0.05 were considered statistically significant, and risk ratios with 95% confidence intervals.

Multivariate logistic regression was used to calculate the odds ratio (OR) as a crude rate and adjusted analysis of DOW and Self-rated health on risk of admission.

Approvals

The study was approved by the Regional Data Authorities of the Capital Region of Denmark j.nr. PVH- 2018–003 I-suite nr. 6219. Use of patient related data was approved by The Agency for Patient Safety j.nr. 3–3013 - 4016/1/

Results

The older population (n = 1525) was chosen from the original dataset of n = 11413 calls to the 1813 medical helpline. Data on high DOW (n = 364) was taken from a selected sub-sample of exclusively patient callers (not relatives) (See Fig. 2).

Table 1 provides the baseline characteristics overview, DOW, Self-rated Health, and triage response in the total older population (n = 1525) and the selected subsample





Fig. 2 Flowchart

of older patients (self-callers) with high DOW (n = 364) stratified by triage outcome.

In the total population of older patients (n = 1525), women were marginally overrepresented. Approximately half of older patients expressed very high or extremely high DOW (4–5).

The majority was triaged by nurses and forty-two percent of call issues were terminated at the end of telephone triage. Among those triaged to a face-to-face consultation (n = 882), 36% were admitted (Table 1, panel A).

The subset (n = 364) is divided by the three de facto triage outcomes (group A, B and C) (Table 2, Panel B). More calls from women were terminated at end of the call without further actions.

Men with higher comorbidity were more likely to be triaged to Face-to-face consultation (Table 2). When adjusted in a binary regression analysis including gender, age, and comorbidity, only comorbidity revealed significant.

Table 3 shows the levels of DOW on triage outcome for the total population and the subset of patient self-callers. High DOW was significantly, and gradient associated to approx. three times higher triage outcome of admission in both the total and the patient self-caller population.

This association of DOW on triage outcomes was kept in the adjusted multivariate analysis. In the subset of callers (n = 364) with less good or poor self-rated health, there was no significant prediction of triage outcome and association with admission in either crude or adjusted analysis (Table 4).

Voice log findings

Table 5 quantifies voice logs from the subset (n = 364) population into specific categories. Most patients were triaged by nurses. Approximately 60% of patient callers across triage groups were alone at time for the call. In Group A, 40% (n = 58) of patients rejected a face-to-face consultation at the emergency department. Sixty percent (n = 88) in Group A were advised to consult primary health care services at the end of call and. Across triage groups a range from 20 to 44% had a consult with their GP prior to the MH1813 call.

Discussion

From previous findings in Danish ED settings, we know that the high turnover of acute admitted medical patients in ED are overrepresented by a minority of older patients; 16% of the Danes above 65 years of ages in 2011, equivalent to 2.7% of the nation's population, represented 50% of all annular hospitalized medical patients and approximately accounted for a 20% readmission rate [4]. The present findings confirm that older citizens calling the MH1813 generally are characterised by being alone (60%) and have ≥ 1 comorbidities, high DOW, low self-rated

Panel A: Total elderly pop	ulation ($n = 1525$)		Panel B: Subset population Se	elf-callers (<i>n</i> = 364)		
u (%)			Group A	Group B	Group C	P-value
			% Face-to-face consultation	+ Face-to-face consultation	+ Face-to-face consultation & admission	
			n (%) (n = 146)	n (%) (n = 145)	n (%) (n = 73)	
Sex	Women	857 (56)	104 (71) (45)	84 (58) (37)	42 (58) (18)	0.03
	Men	668 (44)	42 (29) (31)	61 (42) (46)	31 (43) (23)	
Patient-callers	Self-caller	755 (49)	146 (100)	145 (100)	73 (100)	
	Relative	770 (51)			-	
Age	Median	75; (70–82)	76; (70–82)	72; (68–79)	77; (70–82)	0.78
)	(Interquartile range) > 65 years					
Charlson comorbidity [24]	Comorbidity =0	585 (38)	54 (37)	57 (39)	15 (21)	0.07
	Comorbidity $= 1-2$	335 (22)	29 (20)	32 (22)	20 (27)	
	Comorbidity = 3>	605 (40)	63 (43)	56 (39)	38 (52)	
DOW	Minimally worried = 1	103 (7)			-	0.18
	A little worried = 2	158 (10)	I			
	Somewhat worried = 3	443 (29)	1	1	1	
	Very worried =4	425 (28)	87 (42; 60)	87 (42; 60)	35 (17;48)	
	Extremely worried = 5	396 (26)	59 (40)	58 (40)	38 (52)	
Self-rated health [25]	Excellent = 1	86 (6)	6 (4)	11 (8)	5 (7)	0.03
	Very good = 2	201 (13)	21 (14)	21 (15)	5 (7)	
	Good = 3	334 (22)	26 (18)	33 (23)	17 (23)	
	Less good = 4	437 (29)	43 (30)	52 (36)	17 (23)	
	Poor =5	451 (30)	50 (34)	28 (19)	29 (40)	
Triaged by	Doctor	318 (21)	38 (26)	24 (17)	14 (19)	0.12
	Nurse	1207 (79)	108 (74)	121 (84)	59 (81)	
Triage outcome	÷ Face-to-face consultation	643 (42)	146 (40)	1	1	
	+ Face-to-face consultation	567 (37)	I	145 (40)	1	
	Face-to-face consultation + admission	315 (21)	I	1	73 (20)	

 Table 1
 Sociodemographic overview and triage response

		+ Face-to-face consultation n (%)	÷ Face-to-face consultation n (%)	<i>P</i> -value (Chi²)
Women (<i>n</i> =857)	Comorbidity = 0	198 (56)	155 (44)	0,51
	Comorbidity = $1-2$	105 (53)	94 (47)	
	Comorbidity = 3->	177 (58)	128 (42)	
Men (<i>n</i> =668)	Comorbidity = 0	123 (53)	109 (47)	0,05*
	Comorbidity = $1-2$	79 (58)	57 (42)	
	Comorbidity = 3->	200 (67)	100 (33)	
Total (n=1525)	Comorbidity = 0	321 (55)	264 (45)	
	Comorbidity = $1-2$	184 (55)	151 (45)	
	Comorbidity = 3->	377 (62)	228 (38)	

Table 2 Triage outcome stratified by gender and comorbidity level

*Adjusted for age in a binary regression analysis on + Face-to-face consultation, gender became non-significant (p=0,19), age (p=0,07), comorbidity (p=0,02)

Table 3 Degree of worry and triage outcome for total population and patient self-callers

	÷ Face-to-face consultation	+ Face-to-face consultation	Face-to-face consulta- tion + admission	Risk ratio (Cl 95%)	<i>P</i> -value (Chi ²)
Total Population ($n = 1525$)					<,0001
DOW 1 + 2 (n = 261)	141 (54)	97 (37)	23 (9)	*	
DOW 3 (n = 443)	190 (43)	181 (41)	72 (16)	RR 1,84 (1,18 to 2,87)	
DOW 4+5 (n=821)	300 (37)	301 (37)	220 (27)	RR 3,04 (2,03 to 4,57)	
Patient Self-callers (n = 755)					<,0001
DOW 1 + 2 (n = 160)	82 (51)	67 (42)	11 (7)	*	
DOW 3 (n = 231)	117 (51)	93 (40)	21 (9)	RR 1,32 (0.66 to 2.67)	
DOW 4+5 (n=364)**	146 (40)	145 (40)	73 (20)	RR 2,92 (1,59 to 5,35)	

 * DOW 1 – 2 is considered the unexposed reference group

**Subset population

Table 4 Crude and multivariate adjusted analysis of DOW and self-rated health on admission

Degree of worry	Crude OR (95% CI)	Adjusted for sex and age	Fully adjusted*
		OR (95% CI)	OR (95% CI)
1	Ref	Ref	Ref
2	1.2 (0.36- 4.9)	1.3 (0.4- 5.0)	1.4 (0.4–5.3)
3	1.6 (0.56- 5.5)	1.7 (0.6- 5.8)	1.8 (0.7–6.5)
4	3.3 (1.2–11)	3.4 (1.3–12)	3.3 (1.2–11)
5	4.7 (1.8–16)	4.7 (1.8–16)	4.3 (1.6–15)
Self-rated health	Crude OR (95% CI)	Adjusted for sex and age	Fully adjusted**
		OR (95% CI)	OR (95% CI)
1	Ref	Ref	Ref
2	0.5 (0.2–1.7)	0.6 (0.2–1.9)	0.6 (0.2-2.1)
3	1.3 (0.5–3.7)	1.3 (0.6–3.8)	1.3 (0.5–3.8)
4	1.2 (0.5–3.4)	1.2 (0.5–3.5)	1.1 (0.4–3.1)
5	2.5 (1.0–6.8)	2.5 (1.0–6.8)	1.7 (0.7–4.8)

* adjusted for age, sex, comorbidity and self-rated health

** age, sex, comorbidity and degree of worry

health compared to the background population [25], and elevated risk of hospital admission [18, 19]. High DOW implied a three-fold risk of admission in crude and adjusted analysis though just 18% scored low on DOW. Baseline characteristics in the subset population of self-callers with high DOW did not differ from the total population in accordance with age, comorbidities, SRH and triage outcome. The present findings indicate that at least 35% of callers with high DOW are triaged to a faceto-face consultation at the hospital ED, without causing

Table 5 Voice log template data

		(Group A) ÷ face-to-face consultation (n= 146) n (%)	(Group B) + face-to-face consultation (n= 145) n (%)	(Group C) + face-to-face con- sultation & admitted (n = 73) n (%)
Triaged by	Doctor	38 (26)	24 (17)	14 (19)
	Nurse	108 (74)	121 (84)	59 (81)
Is the citizen in nurse triage forwarded to a	No	52 (48)	116 (96)	54 (92)
doctor?	Yes	56 (52)	5 (4)	5 (8)
Offered but rejects face-to-face consultation	Yes	58 (40)	-	-
Referred to the primary sector	Yes	88 (60)	-	-
Prior consult with GP	Yes	64 (44)	29 (20)	26 (36)
Is the citizen alone?	Yes	108 (74)	67 (46)	45 (61)
How long has the illness lasted?	< 24 h	60 (41)	94 (65)	41 (56)
	> 24 h	86 (59)	50 (34)	32 (44)

an admission. This percentage may be even higher (> 50%) since a considerable proportion of older citizens triaged to consultation (40%) refused to be transferred to the ED following the MH1813 emergency call. Within the ED, 67% of older triaged to Face-to-face consultation were discharged without an admission. Moreover, up to one third of the most worried population have had a contact with their GP prior to the MH1813 call.

These merged findings may reflect an inappropriate re-transition dilemma during illness aggravation in older frail citizens. If hospitalized, older frail patients may be exposed to in-hospital complications and invasive interventions [26]. Since a considerable number are discharged within hours in the ED and subsequently transferred back home or to primary care, this could suggests a significant contribution to the overcrowding phenomena in ED [27]. This may particularly be associated with increased risks of worsened clinical outcomes among vulnerable older citizens [26, 28, 29]. It is also evident that overcrowding and rush in the ED's may e.g. push to an ED staff flow culture mindset in less sync with older patient's needs [30]; lack of patient involvement, inadequate information and counseling upon their medical treatment [31], and risk of readmissions due to unresolved medical conditions [32]. Other studies have also showed that GPs are overburdened [33, 34]. This may be a part of the explanation of why a considerable number of calls from older citizens (42%) had a prior contact with their GP potentially indicating an unresolved and less acute condition. Furthermore, we know that sociodemographic risk contributions as age [17, 34], living or being alone [35], multi-morbidity and multi-pharmacy [26], ethnicity and low income citizens [17] trigger the threshold for contacting out-of-hours services and raise risk of disadvantageous hospital admission [26, 36]. The present paper reveals some of these risks predictors and suggest that male gender compared to females more frequently are referred to a face-to-face consultation. However, a binary regression analysis confirmed that comorbidity was a significant predictor of referral to face-to-face consultation, whereas age nor gender showed a significant association. Even that disease specific information are blurred in the medical helpline calls and we did not gather information on treatment provided in EDs, the findings could reflect frailty characteristics [35] in older citizens calling MH1813. This synergistic biological disease etiology and interaction with sociodemographic exposures related to frailty can explain why an effective resolving of unique disease entities, primarily grounded in treatment-specific, biological causal triage [37], cannot be fully achieved. The findings showed that just 20% of the older citizens ended up being hospitalized and a considerable number being re-transferred to primary care. This corresponds with a previous Danish study showing that 67% are treated directly at the ED without causing admission [38]. Bearing in mind that the older population continuously will evolve [39], the fundamental question is, therefore, how the health care system in several strategies can compensate, prioritize, and develop health care pathways tailored for acute-chronical illness in older citizens? The Health Authority of Denmark suggests an ambitious plan to meet the demands and recommendations for the organization of emergency healthcare in Denmark. This involves multifaceted clinical, interdisciplinary, technology-based, organizational, crosssectional, preventative, health promotive, and societal approaches [40].

Methodological considerations

This study provides "realistic world" data from voice logs and triage outcomes from the MH1813 in 2017, which can limit the generalisability. However, the overall organization and number of citizens calling the medical helpline has not changed significantly since the gathering of data and thus supporting the relevance and representativeness of our results. Moreover, no newer register data on older citizens and DOW exists. Since just 18% scored below 3, it could implicate a lessor predictive importance of DOW related to triage in the older population.

The inclusion of participants in the cohort were recruited at the situational call to MH1813 resulted in a 30% inclusion rate, which raise risk of selection-bias and that mostly resourceful citizens participate. However, statistical analysis has been carried out which showed that those included are comparable to the rest of the older population who contacted the regional emergency number MH1813 in the Capital Region [20, 21]. The authors of this study only included the first call to MH1813, any calls transferred internal is thereby not included in the analysis. Criticism could also be that the quantitative approach extends to descriptive presentation due to the actual calls are relatively short and constitute direct 'real-time' conversations between citizens and health professionals. Every participant voice log was listened twice by the first, last, and co-author with the extraction of factual data and two interpretative categories. Nonetheless, it may be analytically meaningful to extend the analysis of calls with non-verbal, moods and background noises such as respiration to provide a more complete picture of the individual situation. This kind of analysis are much better suited with a qualitative approach.

To better understand the sociodemographic interaction with illness aggravation, future studies should incorporate more sociodemographic information such as educational background, ethnicity, housing conditions, income, family network etc. to gain a deeper insight into societal circumstances and mediating effects related to triage. Moreover, we exclusively investigated triage outcomes in older and did not provide valid information from patient records on e.g., potential diagnosis, vital signs parameters and treatment provided in the ED's,—especially to those re-transferred to primary care as well as providing longitudinal follow-up data on morbidity, hospital length of stay, readmission etc.

Conclusion

The MH1813 triage revealed that older callers were triaged to Face-to-face consultations if they had high DOW or were men representing a higher level of comorbidities than women. A considerable proportion (40%) rejected an offered Face-to-face consultation. Alternative solutions for older citizens triaged to an emergency department should be developed to correspond with older citizens health care needs during acute illness aggravation. The patients' perspectives on being alone, loneliness, rejection of Face-to-face triage, and the retransition dilemma, needs to be further investigated.

Abbreviations

MH1813	Medical Helpline 1813
ED	Emergency department
DOW	Degree of worry
GP	General practitioner
OOH	Out-of-hours
SRH	Self-rated health

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Authors' contributions

SMJ, RBH, ALH and TM prepared the first draft of manuscript. SMJ, TM, RBH made the analyses. SMJ, TM, RBH, FF, KI and ALH interpretated the data and approved the manuscript with suggestions and revisions.

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Data availability

No datasets were generated or analysed during the current study.

Declarations

Ethics approval and consent to participate

The study was approved by the Regional Data Authorities of the Capital Region of Denmark j.nr. PVH- 2018–003 I-suite nr. 6219. Use of patient related data was approved by The Agency for Patient Safety j.nr. 3–3013 - 4016/1/.

Consent for publication

All authors have consented for publication in BMC Health Care Services.

Competing interests

The authors declare no competing interests.

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