2021

Audit of the healthdirect nurse triage service “Attend an Emergency Department immediately” outcome

For Healthdirect Australia

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Executive Summary

Background

Since 2018 the proportion of *healthdirect* callers reaching a triage assessment, or a final outcome, of attending an ED has been increasing and is now close to 25% of all triages. Healthdirect Australia has commissioned the Centre for Health Policy to undertake an audit of calls with an "attend Emergency Department" final outcome to gain a clearer understanding of influencing factors at each point of the triage pathway. This is the fourth clinical review of the *healthdirect* service undertaken by the Centre for Health Policy. The audit identifies opportunities for service improvement, enhanced patient outcomes, and more efficient use of health system resources.

Aims

1. To establish the extent to which Emergency Department triage outcomes (including initial dispositions) on the *healthdirect* helpline are clinically reasonable and appropriate.
2. To establish the extent to which callers who are not triaged to an Emergency Department disposition, but reach a final outcome of attending an Emergency Department have been supported to have their health issues addressed with lower acuity healthcare (also considering the caller's unique circumstances and original intention); and
3. To identify possible areas for further interrogation or improvement for the *healthdirect* helpline from the information obtained through the audit.

Methods

A sampling scheme was developed based on a dataset of more than 50,000 calls from the top 5 triage guidelines in use by *healthdirect*. From the characteristics identified in this large dataset a sample of 291 calls was extracted using an adapted case-control design, incorporating two call pathways that were escalated to Attend Emergency Department Immediately at final disposition (case pathway 1) and final outcome (case pathway two), along with two control pathways representing calls with a See Doctor in 2, 6 or 12 hours" (control pathway 1) and Attend Emergency Department Immediately (control pathway 2) across the full triage pathway. Four expert assessors assessed the clinical appropriateness and communication quality of the calls using an assessment instrument verified by the study Clinical Advisory Group. Data were analysed in Excel for descriptive and summary statistics and multivariate regression was undertaken in Stata to establish factors contributing to escalation at each point of the triage pathway. Free text assessor comments were analysed in NVivo to provide richer context to the contribution of nurse, patient, and health system factors to decision-making resulting in escalation.

Key Findings

Clinical appropriateness of Attend Emergency Department dispositions and outcomes

- 82% of calls were assessed as appropriately triaged at final outcome
- 15% of calls were assessed as overtriaged at final outcome indicating that a combination of nurse and patient factors led to a modest level of inefficiency in the triage process
- Almost half (46%) of calls in the case 1 pathway, were assessed as undertriaged at initial disposition.
- At final disposition, the nurse used clinical judgement to rectify under-triaging in almost every under-triaged call in case 1 pathway
- Overall, the triage clinical decision support software performed reasonably well with the clinical judgement of the nurse providing a significant check
- Under-triaging was low across all pathways at final disposition and final outcome, indicating the service delivers a high level of patient safety
- Over-triaging increased significantly, 12-fold, at final disposition in case pathway 1 but reduced by half in case pathway 2
- At final outcome, over-triaging decreased by a third from final disposition in case pathway 1, demonstrating the impact of caller preference in reaching a final outcome of lower acuity
- At final outcome, over-triaging increased 5-fold in case pathway 2 demonstrating a strong patient/caller influence on escalation of outcome.

Factors contributing to escalation

- A number of nurse, patient and health system factors were found to be associated with escalation of dispositions and outcomes to Attend Emergency Department Immediately
- Nurse clinical judgement was a positive factor in addressing under-triage
- Nurse failure to provide sufficient assistance to the patient to locate appropriate care was a contributor to escalation of final outcome and over-triage
- Patient prior intention, patient anxiety, patient disability and caller/patient caring responsibilities contributed to escalation of final outcome and over-triage
- Patient factors made a slightly larger contribution to escalation of final outcome than nurse factors
- After hours time of call and rural location are associated with escalation of final outcome but were mainly considered appropriate escalation factors by assessors.

Communication

- Nurse communication quality, as in previous reviews, was generally rated highly
- Confirmation of advice to patient was higher than in the previous communication review in 2018, but remains the lowest area of performance in the communication assessment
- Communication scores in specific domains were not found to be associated with escalation in the triage pathway although multivariate regression found total communication score may be an influence
- Deficiencies in nurse assistance to help the patient locate an appropriate point of care may be a hidden component of “confirmation of advice” and should be added as an element to the communication assessment instrument.

Conclusion

The audit of healthdirect Attend ED Immediately triage outcomes has found the majority of these outcomes were clinically reasonable and appropriate. A low level of calls assessed as under-triaged indicates that patient safety is high. A proportion of escalations at the final disposition enhanced patient safety, demonstrating the value of nurse clinical judgement at this point in the triage process. Overall, the computerised clinical decision support software performed well.

The audit also found that some escalations to Attend ED were appropriate in the context of location, time of day and service availability. However, a modest proportion of escalations were deemed inappropriate and represent over-triage, potentially creating health system inefficiency and consumer burden.

A number of patient factors contributed to inappropriate Attend ED outcomes, including prior intention, heightened anxiety, caring responsibilities and disability. It was also found that on occasions greater nurse assistance was required to help the caller locate or navigate to an appropriate primary care option. Nurse communication continues to be generally of high quality and is not significantly associated with inappropriate escalation, except in relation to instances when insufficient nurse guidance was provided to the caller on how to access appropriate lower acuity care.

Patient factors, as the largest contributor to escalation to an “attend ED” final outcome, require further investigation, focusing on elements such as prior intention, heightened anxiety and level of health literacy. Healthdirect Australia may also wish to consider a number of service improvement options to reduce unnecessary escalations to Emergency Department attendance as a final outcome.

Recommendations

It is recommended that Healthdirect Australia consider:

Service improvement

- Further training of staff in use of the National Health Service Directory and provision of support for callers to locate accessible appropriate care
- Generating maps and directions to be sent to a caller’s phone or computer
- “Warm phone transfer” of callers who express doubt about their capacity to find a suitable health service to an identified service, including after hours home doctor services, to book an appointment
- Introduction of a protocol requiring an immediate GP call back to a caller whose final outcome escalates to attend ED.

Further research

- A qualitative study of patient decision-making to better understand the patient perspective that leads to escalation at the final outcome stage of the triage process and determine strategies by which *healthdirect* nurses can support caller decision-making to access appropriate care.

Background

Healthdirect Australia, a company established by the Council of Australian Governments in 2006, is a national not-for-profit organisation providing a range of telephone and digital health information and advice services to the Australian community. The *healthdirect* nurse triage and advice line provides health assessment, triage and advice to approximately 1.3 million callers every year. Delivery of the service is currently sub-contracted to a commercial provider.

In 2021 Healthdirect Australia commissioned the Centre for Health Policy at the University of Melbourne to undertake an audit of the management of callers who reach a final outcome (either as a result of the initial triage or as a result of further advice from the nurse or as result of patient circumstances) of attending an Emergency Department (ED). Healthdirect Australia was seeking, in particular, greater understanding of the context and causal factors in which a lower acuity initial triage disposition was escalated to a final outcome of "attend ED". Since 2018 the proportion of *healthdirect* callers reaching a triage assessment, or a final outcome, of attending an ED has been increasing and is now close to 25% of all triages, approximately 6% higher than the "attend ED" triage outcome proportion of 19.2% in 2018.[1] A clearer understanding of influencing factors at each point of the triage and advice pathway may provide opportunities for service improvement, enhanced patient experience and outcomes, and more efficient use of health system resources. Note that Healthdirect Australia will directly provide the service from 2022 and it is therefore timely to gain a deeper understanding of the factors influencing final outcomes to inform Healthdirect Australia's clinical governance framework and service model.

Objectives of the audit

1. To establish the extent to which Emergency Department triage outcomes (including initial dispositions) on the *healthdirect* helpline are clinically reasonable and appropriate.
2. To establish the extent to which callers who are not triaged to an Emergency Department disposition, but reach a final outcome of attending an Emergency Department have been supported to have their health issues addressed with lower acuity healthcare (also considering the caller's unique circumstances and original intention); and
3. To identify possible areas for further interrogation or improvement for the *healthdirect* helpline from the information obtained through the audit.

The 2021 audit of the clinical safety and appropriateness of *healthdirect* is the fourth review of primary care telephone advice undertaken by the Centre for Health Policy at the University of Melbourne for Healthdirect Australia. Previous reviews were undertaken in 2012-13, 2015 and 2018 based on a review method developed by the University of Melbourne which used simulated patient calls as the principal method for review.[2] After the completion of the 2015 review, new clinical triage software was introduced in the *healthdirect* service. The 2015 and 2018 reviews also included a communication assessment of simulated patient calls using an assessment tool developed by the University of Melbourne.

Ensuring appropriate and efficient use of Emergency Department capacity is a major policy challenge for Governments around the world.[3] Telephone triage and advice lines have been used as one mechanism to manage demand for Emergency Department services and refer patients to timely and appropriate services in the healthcare system.[3] As the scope and scale of telephone triage and advice services expands globally as part of a wide-scale adoption of telehealth practices during the COVID-19 pandemic, it becomes increasingly important to assure the clinical appropriateness and safety of such services. [4] The effectiveness of the communication skills of telephone clinicians and their interaction with the caller is also known to be an important determinant of the caller's ability and willingness to follows the advice provided.[5] Without caller adherence to the telephone triage outcome, the capacity of telephone health helplines to effectively manage demand and guide consumers to appropriate care will be limited.[6-8] Nonetheless, despite the recognised importance of communication in supporting callers to adhere to the service recommendations made by the triage nurse, previous studies have repeatedly shown that a small but significant proportion of *healthdirect* callers triaged to a lower acuity level of care still present at the Emergency Department, most probably reflecting either limited availability of after hours primary care services or other patient factors such as prior intention.[9-13] Recent large scale studies of telephone triage and advice services in Switzerland [14] and the UK [15] have similar findings. An audit of clinical safety and appropriateness of "attend ED" final outcomes that includes clinical and communication assessment as well as identification of the nurse, patient and system factors influencing the triage process will therefore provide a better understanding of "escalation" decision points and help to identify interventions to support appropriate triage outcomes.

Methods

Ethics Approval

Ethics approval to undertake this study was obtained from the University of Melbourne Human Research Ethics Committee (LNR 4C). Approval was granted on 15 October 2021 (Reference Number: 2021-22671-22401-2).

Sampling scheme

Preliminary analysis of call data provided by Healthdirect Australia was used to design a sampling frame that was tailored to assess nurse and patient factors associated with escalation.

Call data relating to the top five symptomatic triage guidelines (Head Injury, Abdominal Pain Adult, Chest Pain, Colds and Flu, Limb Pain) and the top two paediatric triage guidelines (Vomiting Toddler, Cough Child and Toddler) between April and July 2021 was provided. In total, there were 50 487 calls, representing 19 137 distinct covariate patterns, with respect to the following variables:

- Initial Disposition/Final Disposition/Initial Outcome/Final Outcome (combination)
- Gender
- Age group
- Jurisdiction
- After Hours
- Metro/Rural
- Indigenous

Initial analyses revealed that rural location was the most significant predictor of escalation (followed by time of day). We therefore controlled for the impact of Metro/Rural location by including equal numbers of calls from each group in the final sample. By removing location as an explanatory factor, we were able to investigate other factors that might affect the likelihood of escalation.

Figure 1 shows the four combinations of Initial Disposition/Final Disposition/Final Outcome that were sampled. Two distinct patterns of escalation that resulted in a final outcome of "attend ED immediately" were included, one representing escalation by the nurse at initial disposition (Case Pathway 1) and the other escalation by the caller at final disposition (Case Pathway 2). Calls used for analysis were restricted to the three most commonly escalated triage guidelines — limb pain (24% of all escalations), vomiting toddler (19%) and abdominal pain adult (16%). All variables (Table 1) other than Metro/Rural and Triage guideline were randomly sampled to approximate a representative sample of calls received by *healthdirect*.

Table 1. Demographic variables provided by healthdirect included for analysis.

Variable	Possible values
Jurisdiction (State)	All Australian States and Territories
Age Group	1-4, 5-9, … 30-39, 40-49, … 80+
Gender	Male/Female
Caller to patient relationship	Self, mother, father, daughter, son, other
AHGP Eligibility	Yes/No
Cultural Identification	Indigenous/non-Indigenous

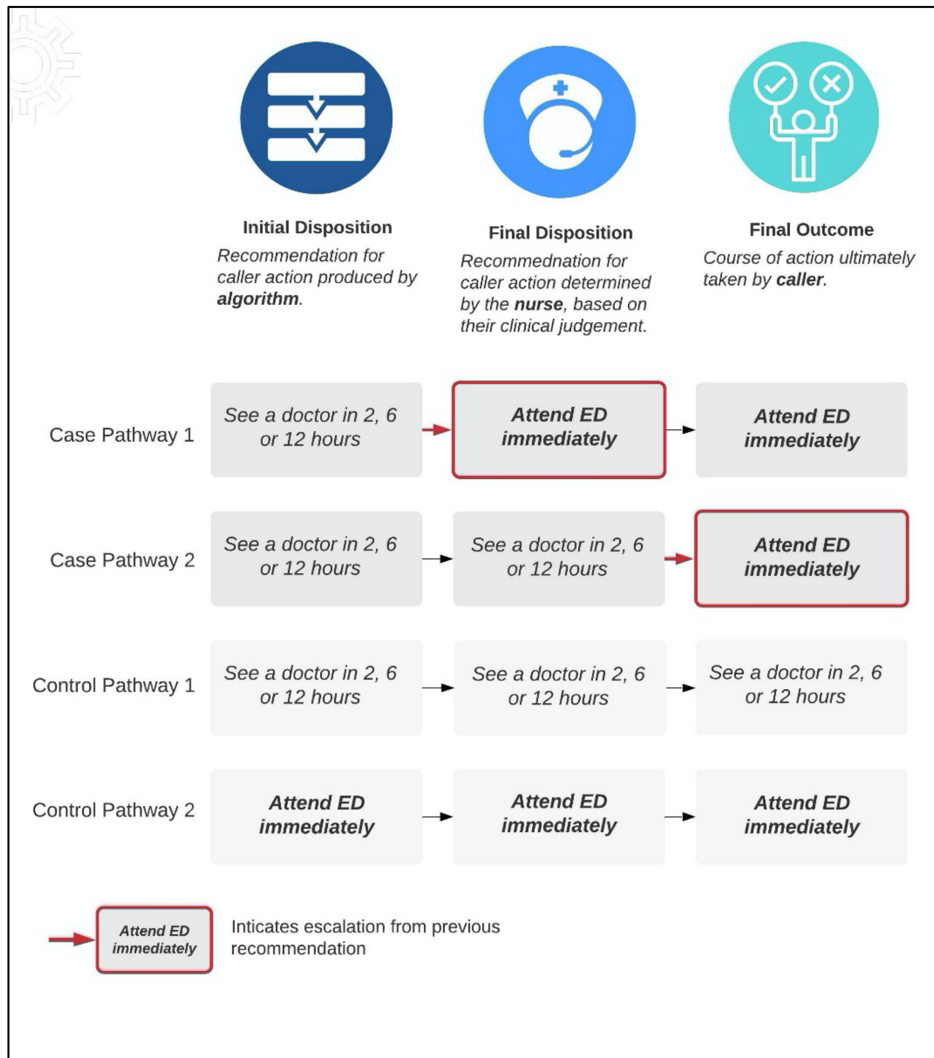

Figure 1. Caller "pathways" used to investigate factors related to escalation to a final outcome of "attend ED immediately". Each pathway refers to a distinct combination of dispositions and outcomes.

Development of the call assessment tool

The call assessment tool (Appendix 1) was adapted from the assessment questionnaire used in audits previously undertaken for Healthdirect Australia by the Centre for Health Policy. The process of adaptation included a workshop with the call assessment team and the project Clinical Advisory Panel, and piloting with a random selection of 12 calls, followed by further discussion and refinement with the call assessment team. The tool used in this audit comprised three domains for assessment:

1. Domain 1: Clinical Appropriateness

Assessors used their clinical judgement of the call to determine whether each disposition/outcome was appropriate, under-triage (required higher acuity care than suggested) or over-triage (required lower acuity triage than suggested).

2. Domain 2: Communication

Quality of communication between nurse and caller was rated using a five-point Likert scale for questions related to client-centredness, active listening and language comprehensibility, and binary Yes/No questions related to the clarity of advice provided by the nurse.

3. Domain 3: Factors contributing to a final outcome of “attend ED immediately”

Assessors recorded any additional features of the call that they thought impacted the outcome, in cases of escalation. These were separated into patient, nurse and system/service factors. The collaborative development of the tool informed the selection of a small number of pre-determined options for each group of factors, such that quantitative data would be available for regression analysis. Assessors were also able to add notes if a feature they thought was important was not included as an option in the instrument.

Call Assessment

The call assessment tool was created as a RedCap survey (redcap.link/healthdirect) for ease of completion and data extraction. Four assessors each completed an approximately equal number of call assessments.

Dr Dianne Crellin is Clinical Associate Professor in the Department of Nursing in the Melbourne School of Health Sciences at the University of Melbourne and Nurse Practitioner in the Emergency Department of the Royal Children’s Hospital. Dr Crellin has held leadership positions in Emergency Nursing in Australia and has published her research on the Australasian Triage Scale.

Mr John Thompson is a lecturer in the Department of Nursing of the Melbourne School of Health Sciences and an Emergency Nurse Practitioner in the Emergency Department of the Royal Melbourne Hospital.

Ms Rachel McKittrick (MPH) is a registered nurse with both practice and research experience in aged care and primary care, currently undertaking a PhD on the role of primary care nurses in the health workforce. She worked on the 2018 Clinical Review of the *healthdirect* helpline.

Dr Jeremy Chalke is a medical practitioner who is currently completing his MPH. He has seven years of clinical experience, including five in Emergency Departments in Australia and the UK.

Data analysis

Quantitative data

Data were tabulated in Microsoft Excel to produce descriptive and summary statistics by frequency and proportion for each assessment item. The statistical package Stata was used to undertake covariate analysis and multivariable regression to determine association between escalated triage outcomes and nurse, patient and service/system factors, as well as examining association between nurse communication and escalation of triage outcome.

Qualitative data

Free text comments were exported to NVivo to identify common themes and gain greater contextual understanding of expert assessors’ determination on both clinical appropriateness and communication.

Results

Preliminary analysis of all call data April-July 2021

Data were provided for calls triaged under the top five guidelines, and the top two triage guidelines that specifically relate to paediatric patients. A total of 50 487 calls were received by *healthdirect* between April and July 2021. Calls were most likely to relate to people residing in NSW, in metropolitan locations, aged between 1-4 years and for abdominal pain. All jurisdictions in which *healthdirect* is available were represented. Callers who identified as Indigenous Australians were overrepresented compared with the national population (Table 2).

Table 2. Demographic characteristics of n=50487 calls related to most frequently used triage guidelines April-July 2021.

		N	%
Gender	Female	29 644	58.7
	Male	20 843	41.3
Age	Paediatric (<20 years)	24 205	48.0
	Adult (≥20 years)	26 272	52.0
Jurisdiction	ACT	1 977	3.9
	NSW	23 612	46.8
	NT	595	1.2
	SA	7 187	14.2
	TAS	2 211	4.4
	VIC	5 861	11.6
	WA	9 044	17.9
Location	Metro	36 193	71.7
	Rural	13 333	26.4
Indigenous status	Non-Indigenous	46 955	93.9
	Indigenous (Aboriginal, Torres Strait Islander or both)	3 080	6.2
Triage guideline	Abdominal pain adult	9 736	19.3
	Limb pain	8 422	16.7
	Chest pain	7 478	14.8
	Colds and flu	7 925	15.7
	Head injury	6 834	13.5
	Cough child and toddler	5 383	10.7
	Vomiting Toddler	4 689	9.3
Time of day	Sociable hours	13 327	26.4
	After hours	37 160	73.6

Overall, 'attend Emergency Department immediately' was the most common Initial Disposition, Final Disposition and Final Outcome, as shown in Table 3.

Table 3. Disposition and outcome distribution of n=50487 calls related to most frequently used triage guidelines April-July 2021. Note, selected advice categories shown, columns to not add to 100%.

	Initial Disposition	**Initial Outcome**	**Final Outcome**
	N (%)		
Activate 000 (any)	7 249 (12.6)	7 349 (14.6)	6 374 (12.6)
Attend ED immediately	9 086 (19.4)	11 267 (22.3)	13 206 (26.2)
See a doctor – 2hr	5 923 (11.7)	5 794 (11.5)	2 996 (5.9)
See a doctor – 6hr	7 697 (15.3)	7 096 (14.1)	3 632 (7.2)
See a doctor – 12hr	5 736 (11.4)	6 475 (12.8)	4 376 (8.7)
Self-Care advice	5 124 (10.2)	4 523 (9.0)	-
Refer to AHGP	-	-	6348

Description of the Go to ED audit sample

The final sample used for assessment and analysis included 291 calls. The majority of callers were female, calling either for self or a child, as shown in Table 4.

Table 4. Demographic characteristics of n=291 sample of calls for audit.

		Case 1	**Case 2**	**Control 2**	**Control 2**	**Total**
		N (%)				
Gender	Female	50 (66.7)	52 (70.3)	42 (60.9)	46 (63.0)	190 (65.3)
	Male	25 (33.3)	22 (29.73)	27 (39.13)	27 (37.0)	101 (34.7)
Caller to patient relationship	Self	36 (48.0)	46 (62.2)	48 69.6)	53 (72.6)	183 (62.9)
	Parent	27 (36.0)	23 (31.1)	16 (23.2)	14 (19.2)	80 (27.5)
	Child	8 (10.7)	3 (4.1)	3 (4.4)	4 (5.5)	18 (6.2)
	Other	4 (5.3)	2 (2.7)	2 (2.9)	2 (2.7)	10 (3.4)
Location	Metro	37 (49.33)	37 (50.0)	33 (47.8)	38 (52.1)	145 (49.8)
	Rural	38 (50.7)	37 (50.0)	36 (52.2)	36 (52.2)	146 (146)
*Indigenous Status**	Non-Indigenous	71 (94.7)	70 (94.6)	62 (92.5)	66 (94.3)	269 (94.1)
	Indigenous	4 (5.3)	4 (5.4)	5 (7.5)	4 (5.7)	17 (5.9)
Triage guideline	Abdominal pain adult	20 (26.7)	27 (36.5)	15 (21.7)	47 (64.4)	109 (37.5)
	Limb pain	26 (34.7)	28 (37.9)	45 (65.2)	17 (23.3)	116 (39.9)
	Vomiting toddler	29 (38.7)	19 (25.7)	9 (13.0)	9 (12.3)	66 (22.7)
Time of day	Sociable hours	27 (36.0)	23 (31.1)	25 (36.2)	15 (20.6)	90 (30.9)
	After hours	48 (64.0)	51 (68.9)	44 (63.8)	58 (79.5)	201 (69.1)
Total		75 (25.8)	74 (25.4)	69 (23.7)	73 (25.1)	291

*n=5 declined not included.

Call assessment – appropriateness of triages

The call assessment team rated the appropriateness of each call at the point of Initial Disposition, Final Disposition and Final Outcome. At each point, the assessors rated the advice provided as

Appropriate, Over-triage (meaning lower acuity care would have been most suitable) and Under-triage (meaning higher acuity triage would have been most suitable).

Appropriateness ratings at each point of disposition/outcome inform our understanding of the ability of the triage algorithm to provide clinically safe and appropriate advice without any other input (Initial Disposition), the soundness of the nurse's clinical judgement with regard to the advice provided by the algorithm (Final Disposition) and caller's decision or preference to take a course of action based on the nurse's advice (Final Outcome).

The Initial Disposition is not provided to the caller, but is recorded in the call database and was made available to assessors. Final Disposition and Final Outcome are in most cases audible in the course of the call, but were also recorded in the call data provided to assessors. In a very small number of calls where the database did not reflect the call recording with regard to Final Disposition and Final Outcome, we adjusted these manually, reassigning the call to a new pathway that reflected the call interaction.

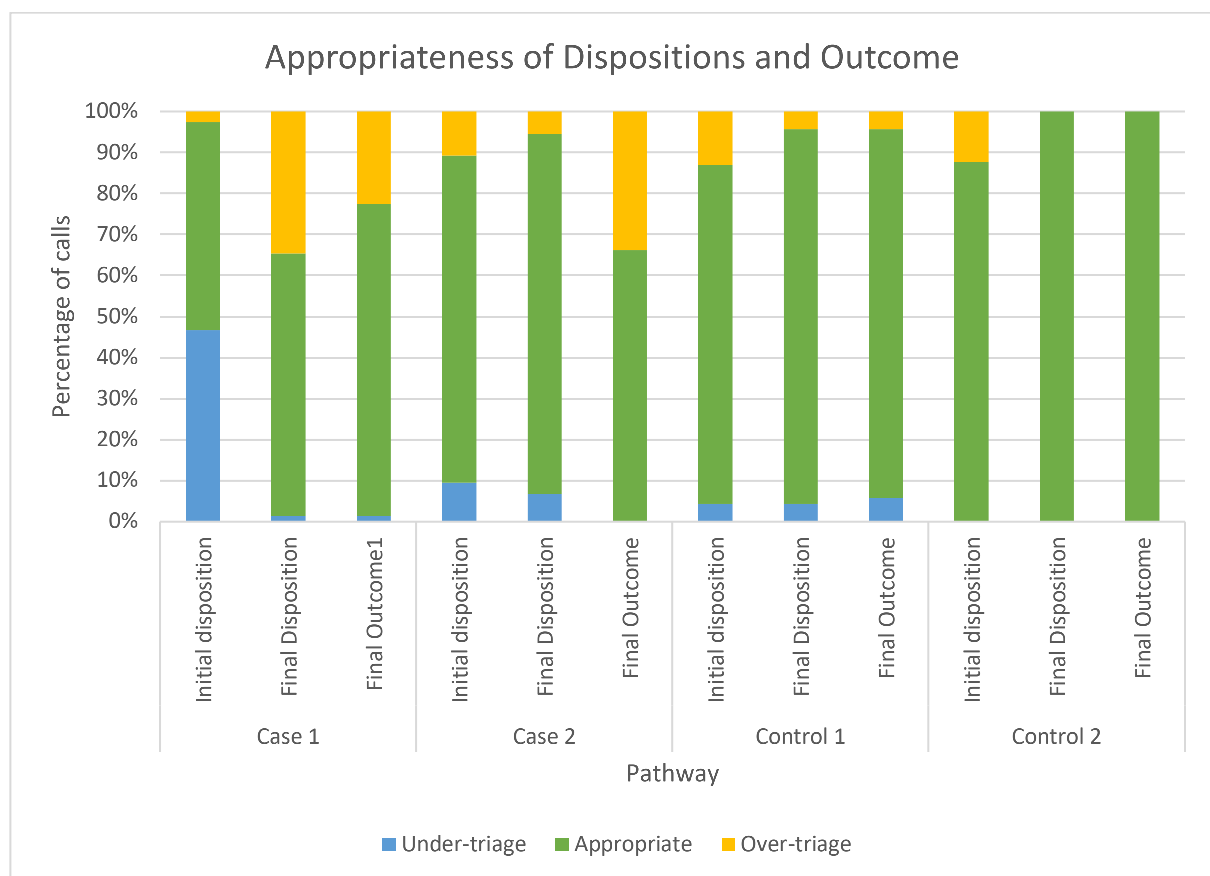

Figure 2. Assessed appropriateness of initial and final dispositions and final outcome, by pathway.

Appropriateness of Initial Dispositions - Performance of the triage algorithm

The advice provided by the triage algorithm was deemed to be appropriate for 75% of calls, indicating that in the majority of cases, it is performing well based on information provided by the caller. Almost 10% of calls were considered to be over-triaged by the triage algorithm of which 32.1% were calls where the advice was to attend ED immediately.

Calls that are under-triaged at the stage of Initial Disposition may be the most important for consideration, as without sound integration of clinical judgement from the nurse, these could lead to unsafe patient outcomes. Based on the assessed appropriateness, a greater proportion of under-triages occurred related to the Vomiting Toddler triage algorithm. Among adult patients (over 20 years of age), under-triage occurred in a slightly greater proportion of calls related to limb pain (17%) compared to abdominal pain (12%) and was more likely among older adults (27% of callers aged 50-70) and the elderly (20% of calls aged 70+).

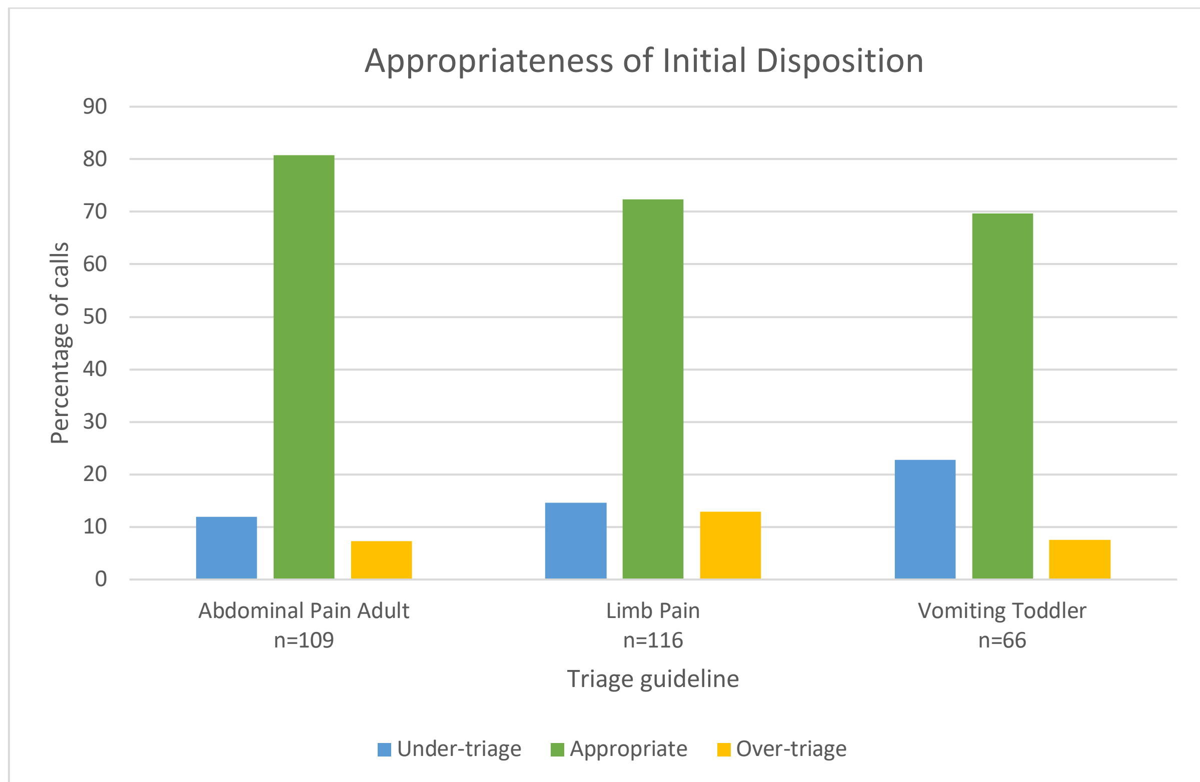

Figure 3. Appropriateness of Initial Disposition, by triage algorithm.

Escalation to Attend the Emergence Department Immediately

The aim of this audit was to assess the appropriateness of calls with a Final Outcome of Attend ED that had been escalated from lower acuity at the point of either Initial or Final Disposition. The decision to escalate the triage advice provided to the caller to Attend ED immediately at Final Disposition is made by the nurse (Case Pathway 1). Conversely, when there is an escalation to Attend ED immediately between Final Disposition and Final Outcome, the decision has been made by the caller (Case Pathway 2). Expert assessment of calls representing each of these pathways to a Final Outcome of Attend ED Immediately allowed appraisal of the clinical appropriateness of these escalations as well as exploration of factors associated with nurse and patient decisions to escalate.

Case Pathway 1 – Nurse escalation

Case pathway 1 included calls that had an initial disposition of See a doctor in 2, 6 or 12 hours and Final Disposition and Final Outcome of Attend ED immediately (Figure 1). Figure 4 shows the number of calls assessed as being under- or over-triaged, or appropriately triaged at the point of Initial and Final Disposition (i.e. the two points between which there was an escalation from see a doctor to attend ED). The percentage change in under-/over-/appropriate triages is shown.

Thirty-five of the total 75 calls in this pathway were deemed to be under-triaged by the algorithm (Initial Disposition). Importantly, the nurses performed very well in recognising that higher acuity care was required, appropriately escalating 32 of these to a Final Disposition of Attend ED Immediately. The majority of over-triage escalations related to calls that our assessors considered would have been more appropriately resolved by the caller seeing a doctor in the community. There was a 1200% increase in the proportion of calls considered to be over-triaged between Initial and Final Dispositions. The complete Case Pathway 1 is found in Appendix 3, Figure 9.

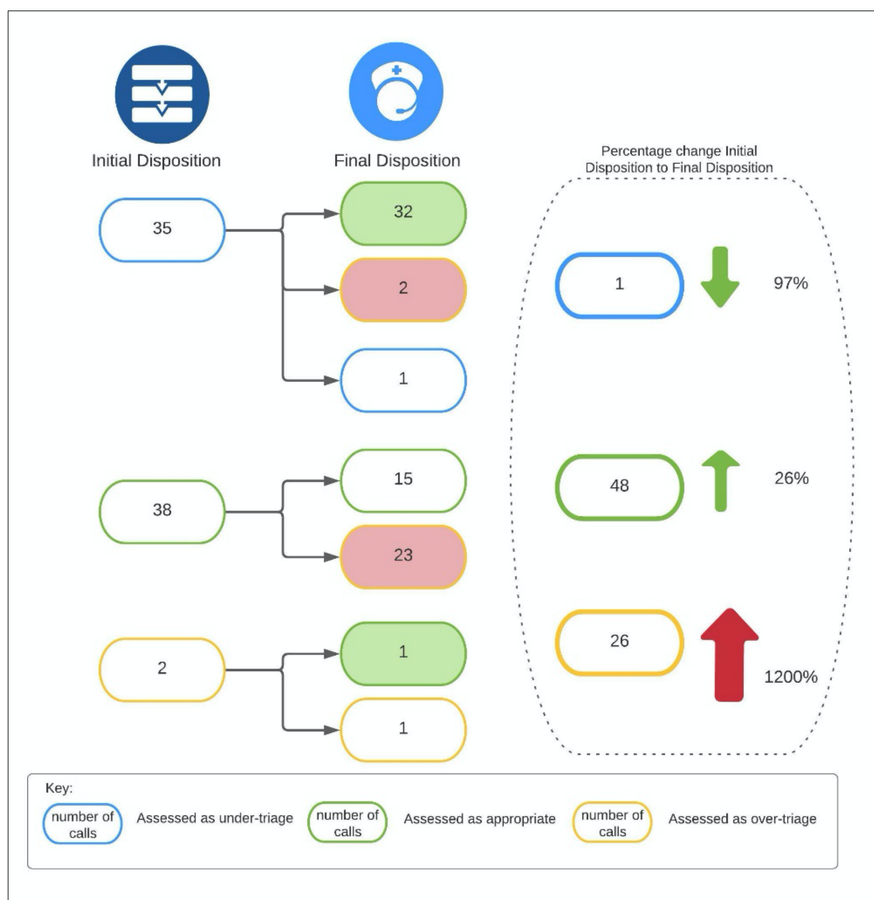

Figure 4. Case pathway 1: change in triage appropriateness between initial and final disposition.

Association of triage level (appropriate vs over-triage at Final Outcome) with exposure variables was assessed for calls in Case Pathway 1. The exposure variables are the scored questions in the call assessment tool (Appendix 1). There were no exposures that were associated with over-triage at the level of statistical significance (data not shown). This is not unexpected, as the effect of each individual exposure assessed is likely to be small. Therefore, we performed multivariable logistic regression analyses to investigate combinations of exposures that together are associated with the likelihood of a nurse-escalated call being assessed as an over-triage (Table 5).

Table 5. Multivariable logistic regression – factors associated with over-triage at Final Outcome in Case Pathway 1.

	Model 1	Model 2
Variables included in the model	b/95% CI/*p**	
Patient factors: Other	0.11 (0.01,1.61) [0.107]	
Nurse factors: Failed to assist to find lower acuity care	8.38 (2.26,31.07) [0.001]	8.95 (2.47,32.41) [0.001]
Nurse factors: Other	11.01 (1.58,76.74) [0.015]	7.73 (1.26,47.57) [0.027]
Observations	74	
AIC	67.504	69.337
BIC	76.720	76.249

*b: unstandardized regression weight, 95% CI: confidence interval for b, *p:* p-value.

Models 1 and 2 have similar values of AIC, and therefore perform similarly in explaining variation in the dataset. Exposure identified as contributing to the likelihood of a Case 1 call being escalated are failure of the nurse to assist the caller to find lower acuity care than the ED, and "other" nurse and patient factors. We therefore investigated the qualitative data collected (assessor notes) relating to each of these factors.

Patient factors: Other

Other patient factors that were identified among Case Pathway 1 calls were having multiple co-morbidities or health complaints or a history of a complex condition, having already seen a GP about the presenting problem without resolution, high pain levels and recurring conditions.

> *The patient (as well as the female ?relative) were clearly not satisfied with seeing a different GP to their own. While the female caller said she was uncertain of what to do, ED is clearly the only other option, and I think they wanted to be validated that this was the right course of action.* ***(Case Pathway 1 Rural)***

> *Does not feel GP will be able to help beyond pain relief. Feels he can "get it fixed" in hospital.* ***(Case Pathway 1 Metro)***

> *Elderly, and complex past history. Patient indicated not many doctors know about PMT suggesting intent to go to ED* ***(Case Pathway 1 Metro)***

Nurse factors: Failed to assist to find lower acuity care

Many calls where the nurse's failure to assist in providing lower acuity care was recorded had notes relating to being close to (but not within) the after-hours period. There were also a handful of instances where the assessor noted that the nurse was led by the caller's prior intention (such as calling while on the way to ED).

> *Does not advise patient of potential after-hours alternatives to ED and does not offer assistance in finding these. I believe a potential contributor to this is the difficulty of assessment due to the volume of information the patient provides, much of which is of uncertain relevance. He expresses exasperation towards the end of the call, and I feel he was keen for it to end.* ***(Case Pathway 1 Metro)***

> *The nurse didn't explore the GP within 12 hrs option with the patient at all (algorithm recommendation) - it was 1.30pm so potential there for a GP visit rather than ED for this call which seemed over triaged (****Case Pathway 1 Metro)***

Nurse factors: Other

Notes made about nurse factors that were not captured by our pre-determined options (see Domain 3 in the Call Assessment tool, Appendix 1) mostly related to the assessor's disagreement with the nurse's clinical judgement. Although this factor is included in the logistic regression models for Case Pathway 2, this disagreement only occurred in a small number of calls.

> *Uncertain reason for escalation to ED - if DVT suspected in lower limb then GP review within 2 hours is appropriate. Maybe concerned about circulatory compromise but this is unlikely with thrombophlebitis and there are no symptoms of this.* ***(Case Pathway 1 Metro)***

> *I feel the nurse was following algorithm and not using clinical judgement. No other red flags. most likely vomited as recently drank water ++. I feel the patient could have had more paracetamol and if no improvement in 6 hours then see GP* ***(Case Pathway 1 Metro)***

Case Pathway 2 – Caller escalation

Calls in Case Pathway 2 are those where the caller disagreed with the nurse advice to see a doctor in the community, and indicated that they intended to attend ED. The call assessors considered 65 of the 74 calls in this pathway to have been appropriately triaged by the nurse (Figure 5). Twenty-one of these calls were escalated by the caller to a Final Outcome of Attend ED Immediately, resulting in a total of 24 over-triaged calls, a 525% increase in over-triages from Final Disposition to Final Outcome. The complete Case Pathway 2 is found in Appendix 3, Figure 10.

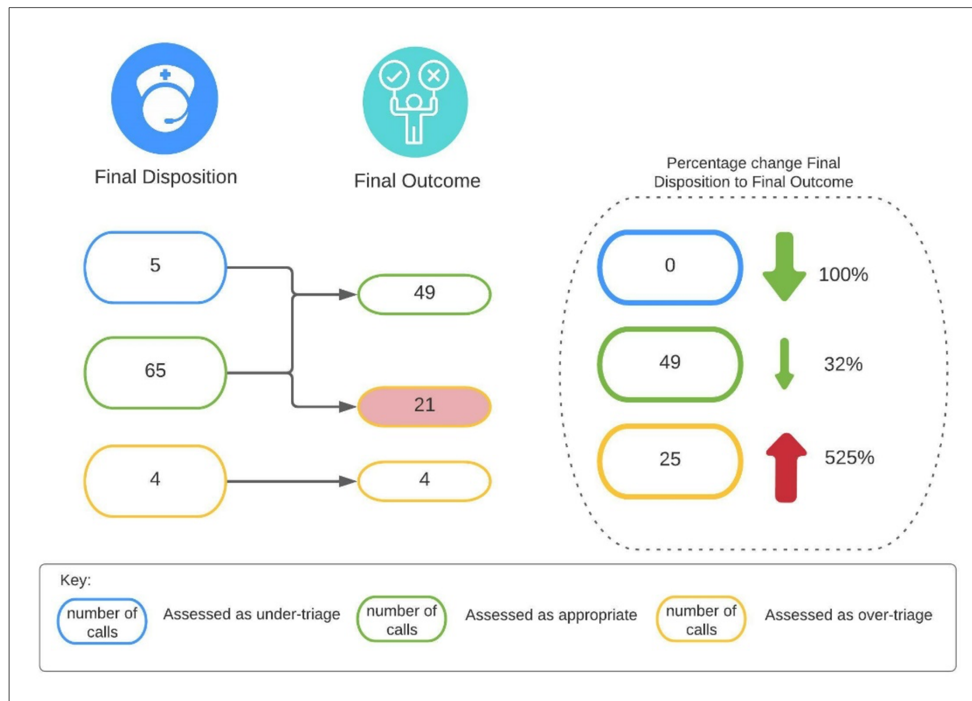

Figure 5. Case pathway 2: change in triage appropriateness between final disposition and final outcome.

As for Case Pathway 1, no exposures were associated with over-triage at Final Outcome at the level of statistical significance (data not shown), and we conducted multivariable logistic regression analysis. The two models of best fit are shown in Table 6.

Table 6. Multivariable logistic regression – factors associated with over-triage at Final Outcome in Case Pathway 2.

	Model 1	Model 2
Variables included in the model	b/95% CI/*p*	
Patient factors: Anxiety or nervousness	1.60 (0.41,6.24) [0.500]	
Patient factors: Prior intention	7.45 (1.79,31.04) [0.006]	9.80 (2.58,37.28) [0.001]
Nurse factors: Failed to assist to find lower acuity care	3.49 (0.92,13.20) [0.066]	
Metro/Rural	0.18 (0.05,0.66) [0.009]	0.21 (0.06,0.71) [0.012]
Total communication score	1.04 (0.88,1.23) [0.655]	
Observations	74	74
AIC	83.963	82.220
BIC	97.787	89.132

*b: unstandardized regression weight, 95% CI: confidence interval for b, *p:* p-value.

Patient factors of anxiety or nervousness (about their condition) and prior intention contribute to the likelihood of a patient inappropriately escalating the nurse's advice and attending ED. The same nurse factor as identified in Case Pathway 1 calls, the failure to provide assistance in finding lower acuity care was also a factor in one of the models in Case Pathway 2, indicating that this factor is important among all calls that are inappropriately escalated to a Final Outcome of Attend ED Immediately. Model 1 also shows that a Final Outcome of Attend ED Immediately was less likely to be considered inappropriate by the call assessors if that caller was in a rural location. This may be related to the expressed or expected unavailability of services in these areas. Lower total communication scores, which give a general indication of the quality of the nurse's communication in the call across all assessed domains, is also included in Model 1.

Patient factors: Anxiety

> *Caller/father seemed anxious for a quick answer.* ***(Case Pathway 2, Metro)***

> *Patient admitted anxiety with family history of blood clotting*
> ***(Case Pathway 2, Metro)***

> *Seemed anxious - providing a lot of information, not always directly answering the nurses' questions. At the time of calling, patient was the sole carer for 3yo daughter Seemed worried that because she has a cough/COVID times, whether it is safe for her to go out in the community including to attend for health treatment.* ***(Case Pathway 2, Metro)***

Patient factors: Prior intention

Seemed the nurse realised the caller was on the way to the hospital and that he was going there regardless, but she went through the process of assessing the issue anyway - assume the caller was put through to healthdirect by the hospital, when the caller rang the hospital on his way there with his son. The nurse did not seem to provide assistance to locate a GP for the caller & his son.

(Case Pathway 2 Rural)

I think there is prior intention to go to ED. At the start of the call he says he wasn't sure if he should call triple-zero and he tells us his surgeon said he could get emergency surgery if the pain is unbearable. While he doesn't outright say it, I think he intended to go to hospital. The patient understandably wants something to help the pain, and although he has someone who can transport him he is only willing to get them to take him to ED (and not to the GP).

(Case Pathway 2, Metro)

Metro/Rural

Symptoms/pain seemed notable/needing face to face medical assessment & management, and given the time of evening of call (10.47pm), it would have been difficult to achieve seeing a GP in 6 hours and also the rural location
(Case Pathway 2, Rural)

In context rural location and no alternative - although it is 3pm on a Friday, this is what the caller claims ***(Case Pathway 2, Rural)***

Communication

Communication Assessment

Communication was assessed using a combination of five-point Likert scales and binary yes/no responses for the presence or absence of a number of communication features that represent client-centredness, active listening, appropriate language and clear advice (Appendix 1 Assessment Tool Domain 2). Assessment of the quality of communication used by the nurse was very positive overall. Figure 4 shows that there was no difference in the overall assessed quality of communication between each of the four pathways. As the communication scores did not differ between pathways,

and none of the communication variables were associated with over-triage in either of the Case pathways, we present communication data for the whole sample.

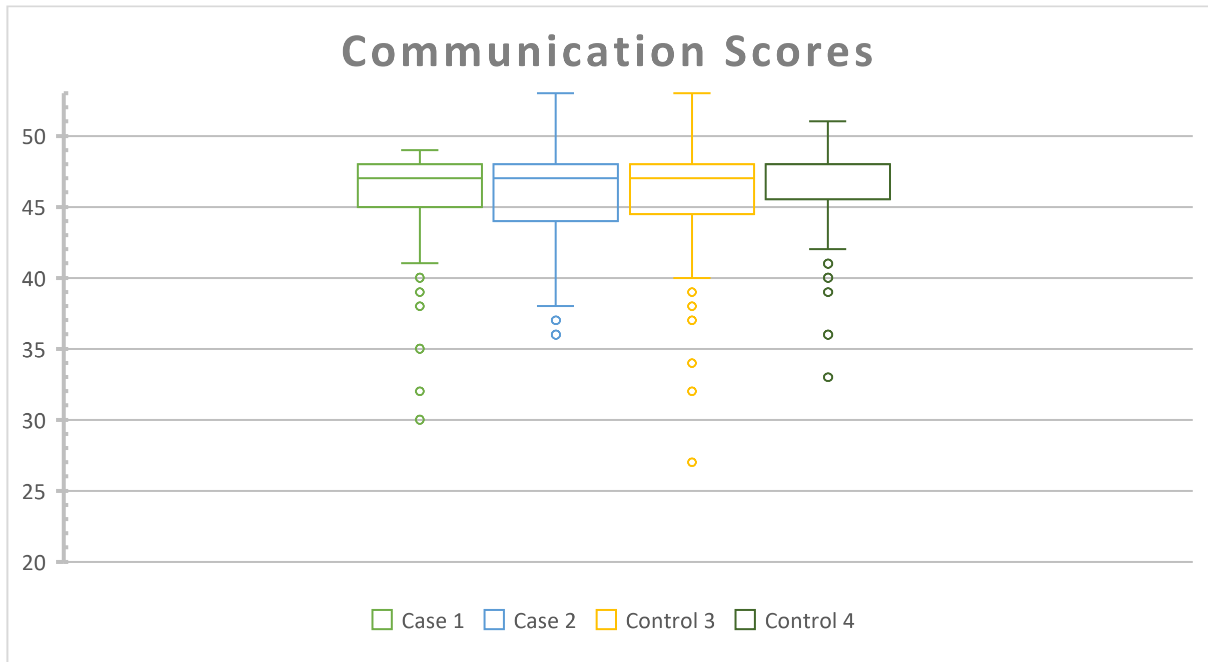

*Figure 6. Total communication scores, by pathway. *Maximum possible score = 53. Likert Scoring: Always = 4, Usually = 3, About half the time = 2, Rarely = 1, Never = 0 Binary scoring: Yes = 1, No = 0*

Figure 7 shows the proportion of calls which were assessed as including each of the included communication features “Always”, “Usually”, “About half the time”, “Rarely” or “Never”. All of the features were present always or usually in over 90% of calls. Of note, nurse confirmation of their understanding of the caller’s needs has improved markedly since previous audits, but was assessed as always occurring in a lower proportion of calls than other assessed communication features. We were unable to assess the nurse’s use of the caller’s name, as first names were redacted from call recordings prior to being provided to the research team.

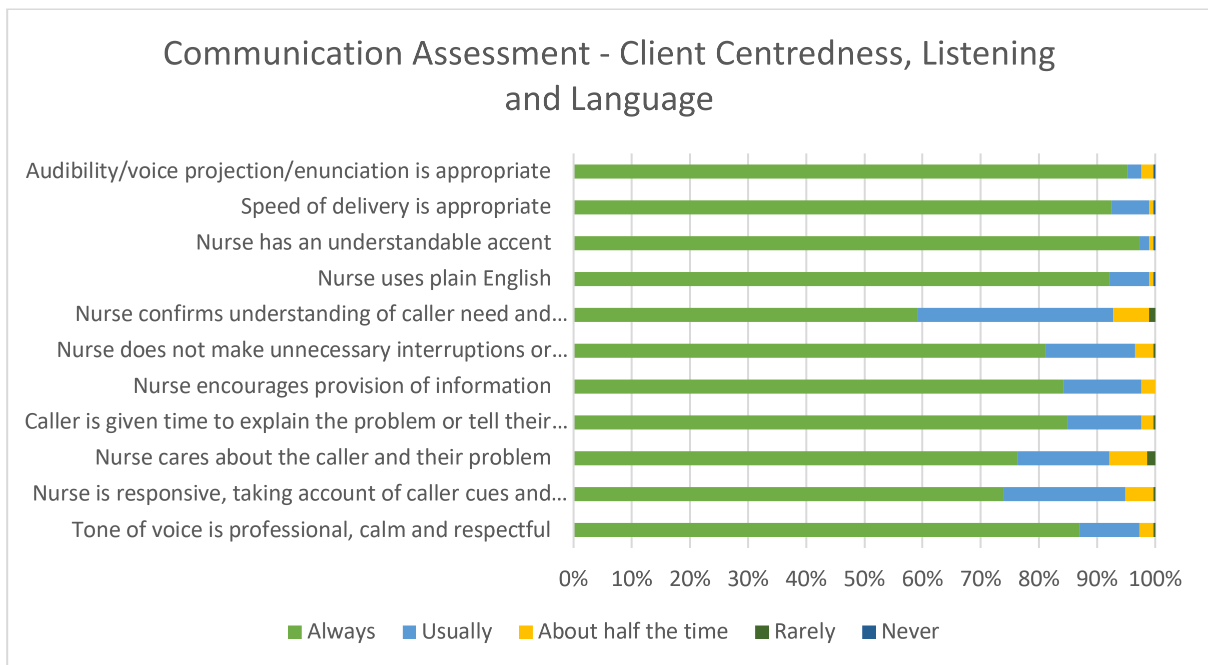

Figure 7. Assessment of nurses' communication factors related to client-centredness, language and listening – all calls.

Five communication features were assessed with a yes/no binary rather than a Likert scale and these are shown in Figure 8. Signposting is the use of explicit statements by health providers to inform a patient what they are about to say or do and may also be referred to a "call management". Our Clinical Advisory Panel identified signposting as an important element of communication in a phone consultation, as it provides structure, engages the patient and helps them to understand the direction the consultation is going, as well as allowing the nurse to share their thoughts and gather important details to inform their clinical decision making. Importantly, signposting was used in less than half of the assessed calls (Figure 8).

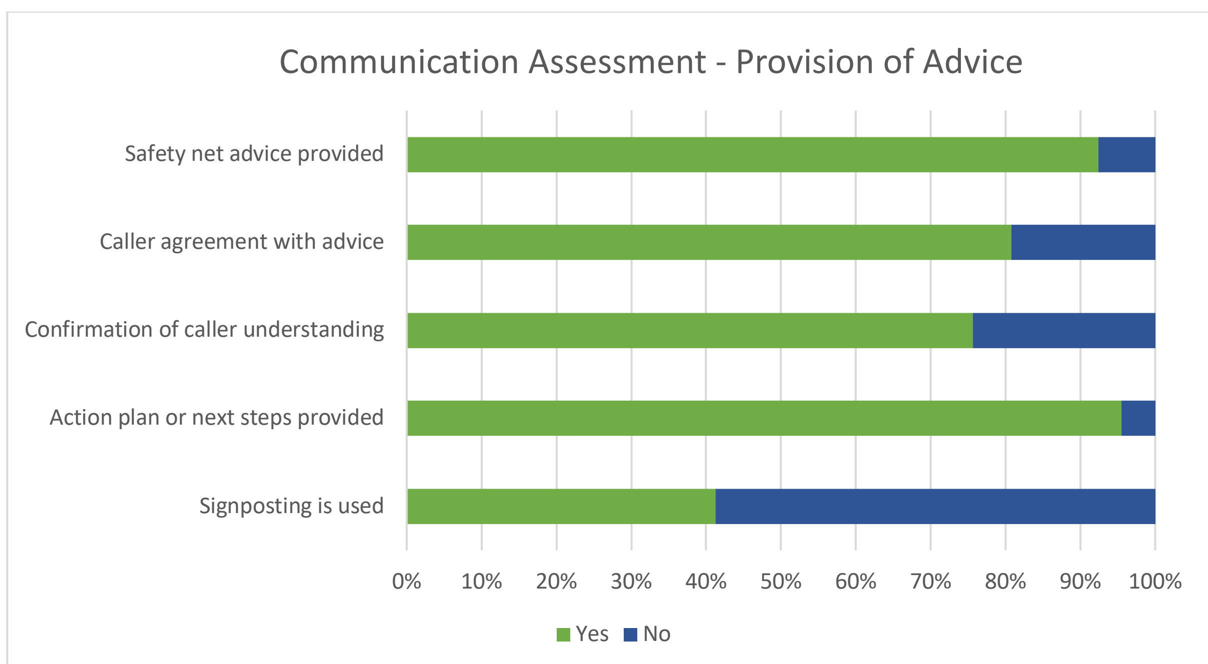

Figure 8. Presence/absence of communication factors related to call management and advice provided.

Discussion

The audit of healthdirect calls has provided a contextually rich understanding of Emergency Department triage outcomes, the clinical appropriateness of those outcomes and the factors associated with escalation of initial and final dispositions to a final outcome of Attend ED Immediately. The study has provided insights into the performance of the clinical triage software currently in use on the national helpline, the role of the triage nurse's clinical judgement and the ways in which nurse, patient and health system factors contribute to escalation of initial or final dispositions from See a doctor within 2, 6 or 12 hours to a final outcome of Attend ED Immediately.

Performance of the triage software at initial disposition

The initial disposition in the *healthdirect* triage pathway is generated by a clinical software package using clinical decision algorithms. Of particular interest from a service improvement perspective is the finding that almost half (46% n=35 of 75) of calls in the case 1 pathway, in which an escalation subsequently occurred at final disposition, were assessed as under-triaged at initial disposition. Under-triaging can result in a risk to patient safety through delay in obtaining appropriate care and treatment.(16) Under-triage of the initial disposition was considerably less in the second case pathway (less than 10%), in which an escalation to Attend ED Immediately occurred at the final outcome point of the pathway, minor in control pathway 1 (less than 5%) which comprised patients disposed as needing to see a doctor within hours at every step in the triage pathway, and zero in control pathway 2 in which there was agreement at every point in the triage pathway that the patient should attend ED. Across the total set of case and control calls approximately 15% (n= 45) were assessed as under-triaged at the initial disposition generated by the clinical decision support software. The majority, 75%, were assessed as appropriate with fewer than 10% of calls considered to be over-triaged at initial disposition. Over-triage can lead to inefficient use of health system resources and patient anxiety or inconvenience but is not necessarily a safety risk.(16) There were no statistically significant differences between triage guidelines in either under-triage or over-triage categories at initial disposition although the Vomiting Toddler triage guideline showed a slightly higher level of under-triage than other guidelines. Healthdirect Australia may wish to consider whether these proportions are within an acceptable range of potentially inappropriate initial dispositions. We note, as we have in previous reviews, that there is no published literature on defined thresholds for acceptable levels of over-triage in comparable telephone triage and advice services and that, in relation to under-triage, the aim of sound clinical governance is to minimise under-triage and the associated risk to patient safety.(16)

Nurse clinical judgement at the final disposition

Pleasingly, in this audit, under-triaging by the computerised algorithm in the case 1 pathway was largely rectified by nurses using their clinical judgement at the point of final disposition. At this point, 64% of case 1 pathway calls were assessed as appropriate and while our assessors considered approximately a third of calls in this pathway to be over-triaged by having an Attend ED Immediately outcome, only one patient was considered to be under-triaged at the point of final disposition, indicating that nurse clinical judgement ensured a safer outcome for a significant proportion of callers. This finding highlights the importance of having trained clinicians as call takers and triagists in a national telephone and triage service.(17)

Of those calls considered to be over-triaged at the final disposition point in the case 1 pathway, our assessors concluded that seeing a doctor within a shorter time frame would have been a clinically appropriate recommendation rather than attending ED. Across all call pathways, approximately 11%

of calls were assessed as over-triaged at final disposition, mainly within the case 1 pathway, suggesting there is scope for Healthdirect Australia to encourage nurses to exercise clinical judgement to reduce unnecessary demand on Emergency Department resources. Nurse judgement at final disposition in the case 2 pathway (where escalation occurred at the later final outcome point) was also largely appropriate (87%, n=65 of 74) with nurse clinical judgement leading to a reduction in both the number of overtriage and undertriage initial dispositions.

Patient factors influencing the final outcome

The audit shows that patient factors can play an important part in mediating the final outcome of the triage process. In the case 2 triage pathway which comprised calls escalated at the final outcome (i.e. not by the clinical algorithm at initial disposition and not by the nurse at final disposition) just over a third of calls (n=25 of 74) were assessed as over-triaged, although only four calls were assessed as over-triaged at final disposition. Our analysis shows that patient factors such as prior intention to attend ED, elevated levels of patient anxiety, patient frailty or disability and/or the presence of other dependants in the household contribute to an escalation of outcome at this point. Prior intention of the caller has been shown in a number of studies to significantly influence patient attendance at the Emergency Department even if a triage clinician has recommended a lower level of care [9-11] Of note, in the case 1 call set, the level of over-triage of approximately 22% (n=17 of 75) was a reduction from over a third of calls over-triaged at the final disposition point, indicating that the patient's input had led to a reassignment of the Attend ED Immediately final disposition to a lesser level of care at final outcome in some instances. While our audit did not find an association with demographic characteristics of callers, such as age and gender, the larger call set from which our sample was drawn showed that Aboriginal and Torres Strait Islander callers were more likely to reach an escalated final outcome. A recent Australian study of *healthdirect* users who attended the ED, contrary to advice received, tended to be younger adults and more likely to reside in a lower socioeconomic area, [12,13] which may raise the possibility of lower health literacy contributing to caller decisions to seek care at the ED.

Overall, 15% (n=45 of 291) of calls were assessed as over-triaged at final outcome indicating that a combination of nurse and patient factors lead to a modest level of inefficiency in the triage process with however more than 82% of calls assessed as appropriately triaged at final outcome. The very small proportion of under-triaged calls across the total call set indicates that the *healthdirect* full triage process generally delivers safe outcomes for patients.

Health service and system factors

The audit investigated the impact of availability of appropriate services, time of day and geographic location of the caller in relation to appropriateness of outcome. Analysis of the initial larger data set of calls from which the sample was drawn indicated that both rural location and after hours timing were associated with call escalation to attend ED. Further interrogation of these factors within the sampled calls has indicated that calls from rural locations were no more likely than calls from metropolitan areas to be assessed as over-triaged, suggesting that escalation of rural calls was considered appropriate by the audit assessors. Similarly, while after hours timing was associated with escalation of calls to attend ED, this was more likely to be considered appropriate escalation by the assessors. In relation to both factors, it appears that nurse and/or patient awareness of limited access to primary care services in the rural location or in the afterhours period is a relevant and acceptable driver of outcome escalation. After hours call time and rural location have been identified in other studies as factors that underpin ED attendance. [11-15] There may be opportunities to further reduce the number of callers in these categories by expeditious call back from the Afterhours GP Helpline and warm transfer to after hours services, discussed further below.

Nurse assistance to caller in locating an appropriate service

A relatively small proportion of calls (13%, n=37) were identified in which the assessor considered escalation occurred at final outcome because the nurse did not actively assist the patient to identify an appropriate primary care service that would be accessible to the caller. This was identified as a significant nurse factor in our regression analysis which may intersect with both service availability and patient preference in determining an escalated final outcome to Attend ED Immediately. There is scope for service improvement in relation to assisting callers to identify an accessible and appropriate service. Further training of staff in use of the National Health Service Directory, generating maps and directions to be sent to a caller's phone or computer, "warm phone transfer" of the caller to an identified service, including after hours home doctor services, to book an appointment and a protocol requiring an immediate GP call back to a caller whose final outcome escalates to attend ED, regardless of location or time, are possible options to support appropriate patient outcomes, reduce burden on EDs and consumers and encourage efficient use of the health system.

Nurse communication

As in previous clinical reviews of *healthdirect*, nurse communication across the four domains of patient centredness, active listening and clarity of language and clarity of advice were high. Of note, safety net advice is consistently delivered and nurses were assessed as being mainly caring and clear in their language and advice. Compared with previous reviews, confirmation of the caller's understanding of the advice received had improved but remains slightly lower in ratings than other nurse communication domains. It was not however highlighted by our assessors as a contextual factor in patient escalation of final outcome. No significant association was found between nurse communication score and appropriateness of triage final disposition or final outcome, although in the case two pathway, the total nurse communication score was present as a factor in the model of best fit, indicating that the overall quality of communication may have an influence on patient decision-making.

Strengths and weaknesses of the method

The audit method has provided a robust sampling frame, using an adaptation of the case-control study design to independently assess real calls, enabling the researchers to test performance of the clinical software at initial disposition and gauge the impact of nurse and patient factors on the final disposition and outcome. The online assessment tool developed in conjunction with our Clinical Advisory Group enabled collection of data across standard indicators while also capturing a range of other influences identified by the expert assessors in free text.

Repeat use of the communication assessment instrument employed in previous clinical audits provided robust measurement of quality of *healthdirect* nurse communication. In light of this study's findings, a future useful addition to the communication tool would be to score, as part of the clarity of advice domain, the degree of assistance provided by the nurse to the caller to locate an appropriate and accessible healthcare service.

We used a moderated approach to minimise assessor variability using a sub-sample of calls for assessment by all four expert assessors, with a follow up discussion of scoring on each item in the assessment tool to reach agreement on final assessment values.

The total sample size of usable calls has provided sufficient statistical power to enable us to gain a more nuanced understanding of the triage process leading to escalation to Attend ED Immediately outcomes and clearly identify nurse and patient factors relevant to escalation. A larger sample may provide even greater confidence in the findings but it was not possible to obtain a larger sample due to cost constraints and burden on the service provider in call extraction and redaction of caller identifying details. The necessity to redact caller identifying information such as first name also removed the possibility of repeat assessment of use of callers name in communication assessment.

Conclusion

The audit of healthdirect "attend ED" triage outcomes has found the majority of Attend ED Immediately outcomes were clinically reasonable and appropriate. A low level of calls assessed as under-triaged indicates that patient safety is high. A proportion of escalations at the final disposition enhanced patient safety, demonstrating the value of nurse clinical judgement at this point in the triage process. Overall, the computerised clinical decision support software performed well.

The audit also found that some escalations to Attend ED Immediately were appropriate in the context of location, time of day and service availability. However, a modest proportion of escalations were deemed inappropriate and represent over-triage, creating health system inefficiency and consumer burden. A number of patient factors contributed to inappropriate outcomes, including prior intention, heightened anxiety, caring responsibilities and disability. It was also found that on occasions greater nurse assistance was required than was provided to help the caller locate or navigate to an appropriate primary care option. Nurse communication continues to be generally of high quality and is not significantly associated with inappropriate escalation, except in relation to instances when insufficient nurse guidance was provided to the caller on how to access appropriate lower acuity care. The overall quality of communication may contribute to patient decision-making, and although the action of this contribution is not clear in the available data, we hypothesise that confirmation of advice and next steps for the patient may influences patient decision-making at final outcome. Patient factors, as the largest contributor to escalation to an Attend ED Immediately final outcome, require further investigation, focusing on elements such as prior intention, heightened anxiety and level of health literacy. Healthdirect Australia may also wish to consider a number of service improvement options to reduce unnecessary escalations to Emergency Department attendance as a final outcome.

Recommendations

It is recommended that Healthdirect Australia consider:

Service improvement

- Further training of staff in use of the National Health Service Directory and provision of support for callers to locate accessible appropriate care
- Generating maps and directions to be sent to a caller's phone or computer,
- "Warm phone transfer" of callers who express doubt about their capacity to find a suitable health service to an identified service, including after hours home doctor services, to book an appointment
- Introduction of a protocol requiring an immediate GP call back to a caller whose final outcome escalates to Attend ED Immediately

Further research

- A qualitative study of patient decision-making to better understand the patient perspective that leads to escalation at the final outcome stage of the triage process and determine strategies by which *healthdirect* nurses can support caller decision-making to access appropriate care.

References

1. Personal Communication, Manager of Clinical Governance, Health Direct Australia, March 11, 2022
2. McKenzie R, Freed GL, Spittal M, Williamson M. Safety on the line: a short report on the development of a quality improvement model for a nurse and GP telephone helpline using simulated patients. Quality in Primary Care. 2015;23:163-6.
3. Rademacher, NJ et al. Use of Telemedicine to Screen Patients in the Emergency Department: Matched Cohort Study Evaluating Efficiency and Patient Safety of Telemedicine. JMIR medical informatics. 2019; 7(2): e11233. doi:10.2196/11233
4. McKenzie R, Kanhutu KN. Telehealth quality check: Is it time for national standards? (2021). Australian Journal of General Practice. 50(10):778-81. doi: 10.31128/AJGP-05-21-5967
5. Lake R, Georgiou A, Li J, Li L, Byrne M, Robinson M, et al. The quality, safety and governance of telephone triage and advice services – an overview of evidence from systematic reviews. BMC Health Services Research. 2017;17(1):614.
6. De Coster C, Quan H, Elford R, Li B, Mazzei L, Zimmer S. Follow-through after calling a nurse telephone advice line: a population-based study. Family Practice. 2010;27(3):271-8.
7. Valanis BG, Gullion CM, Moscato SR, Tanner C, Izumi S, Shapiro SE. Predicting patient follow-through on telephone nursing advice. Clinical Nursing Research. 2007;16(3):251-69.
8. Hansen, E.H., Hunskaar, S. Understanding of and adherence to advice after telephone counselling by nurse: a survey among callers to a primary emergency out-of-hours service in Norway. Scand J Trauma Resusc Emerg Med*.* 2011; 19:48. https://doi.org/10.1186/1757-7241-19-48
9. Ng JY, Fatovich DM, Turner VF et al. Appropriateness of *healthdirect* referrals to the emergency department compared with self-referrals and GP referrals. Med J Aust 2012;197(9):498-502.
10. Sprivulis P, Carey M, Rouse I. Compliance with advice and appropriateness of emergency presentation following contact with the *HealthDirect* telephone triage service. Emergency Medicine. 2004; 16:35-40. https://doi.org/10.1111/j.1742-6723.2004.00538.x
11. McKenzie R, Dunt D, Yates A. Patient intention and self-reported compliance in relation to emergency department attendance after using an after hours GP helpline. Emergency Medicine Australasia. 2016; 28 (5):538-543 https://doi.org/10.1111/1742-6723.12619
12. Tran DT, Gibson A, Randall D, Harvard A, Byrne M, et al. Compliance with telephone triage advice among adults aged 45 years and older: an Australian data linkage study, BMC Health Services Research. 2017; 17:512 10.1186/s12913-017-2458-y.
13. Gibson A, Randall D, Tran D.T, Byrne M, Lawler A, Harvard A, et al. Emergency Department Attendance after Telephone Triage: A Population-Based Data Linkage Study. Health Serv Res. 2018; 53: 1137-1162. https://doi.org/10.1111/1475-6773.12692
14. Thierrin C, Augsburger A, Dami F, Monney C, Staeger P, et al. Impact of a telephone triage service for non-critical emergencies in Switzerland: A cross-sectional study. PLoS ONE. 2021; 16(4): e0249287.https://doi.org/10.1371/journal.pone.0249287
15. Lewis J, Stone T, Simpson R, Jacques R, O'Keeffe C, Croft S, et al. Patient compliance with NHS 111 advice: Analysis of adult call and ED attendance data 2013–2017. PLoS ONE. 2021; 16(5):e0251362.
16. McKenzie R, Dunt D, Robinson M. Calling for the doctor: using simulated patients to assess the quality of nurse and GP advice on an out-of-hours telephone helpline. *Journal of Medical Safety*. 2015; 1:43-50.
17. Moth G, Huibers L, Vested P. From doctor to nurse triage in the Danish out-of-hours primary care service: simulated effects on costs. Int J Family Med*.* 2013; http://dx.doi.org/10.1155/2013/987834

Appendix 1: Clinical Audit Assessment Tool

Healthdirect call assessment tool

This is the healthdirect Go to ED Audit call assessment tool.

Healthdirect Call ID

You can use cut and paste to insert the ID from the clinical data spreadsheet or the call recording file name. You will be asked to re-enter this number at the end of the survey to ensure the data entered relates to the correct call.

____

Assessor's initials

____

Domain 1: Clinical Appropriateness You are required to assess the clinical appropriateness of clinical advice provided by healthdirect at three points: initial disposition, final disposition and final outcome.

Initial disposition is the course of action that is suggested by the healthdirect algorithm. The nurse may not necessarily convey this to the caller verbally, however this can be found in the clinical data spreadsheet.

Assessment of the appropriateness of the initial disposition will help us determine whether the algorithm is appropriately sensitive and specific to information provided by the caller.

Final Disposition is the appropriate course of action determined by the nurse, incorporating their own clinical judgement or assessment of other contextual factors. This is what they will advise the patient to do during the call. The final disposition may be the same or different to the initial disposition.

Final Outcome is the course of action that the caller decides on after hearing the advice given by the nurse. In this audit, the final outcome of calls will not be of lower acuity than the final disposition, but it may be the same.

If the Final Disposition or Final Outcome is not clear from listening to the call, these are also recorded in the clinical data spreadsheet.

Assessment Options

You are required to assess the advice given at each point described above. You should base your assessment on the triage options that are available to the nurse, which are:

Activate 000 Attend Emergency Department immediately Go to a pharmacist Refer to AGHP Schedule a routine appointment with your doctor or GP practice See a doctor within the next 1-3 days See a doctor within the next 12 hours See a doctor within the next 6 hours See a doctor within the next 2 hours Self-Care Advice Under-triage: The suggested course of action

is of lower acuity than you would advise caller (e.g. The disposition/outcome suggests seeing a doctor in any of the listed timeframes, but you would advise attending ED immediately,)

Appropriate: The suggested course of action is the same as what you would advise.

Over-triage: The suggested course of action is of greater acuity than you would advise the caller (e.g. the disposition/outcome suggests seeing a doctor within 2 hours, but you would advise seeing a doctor within 12 hours).

Appropriateness of initial disposition (advice determined by the algorithm)	◯ Under-triage ◯ Appropriate ◯ Over-triage
Notes If required	
Appropriateness of final disposition (advice provided by nurse)	◯ Under-triage ◯ Appropriate ◯ Over-triage
Notes If required	
Appropriateness of final outcome (what the patient decides to do at the end of the call)	◯ Under-triage ◯ Appropriate ◯ Over-triage
Notes If required	

Domain 2: Communication The aim of the communications assessment is to assess how well the clinician (nurse) communicates and interacts with the caller to the healthdirect helpline. Communication is separated into four further domains: client-centredness, active listening, language comprehensibility and clarity and confirmation of advice.

The assessor should listen to the recorded call and decide whether they would consider each of the communication elements listed below to be true or false overall.

Client-centredness relates to use of the caller's name, tone of voice of voice (friendly, calm, professional, respectful); responsiveness (takes account of caller cues such as anxiety, fear, distress) and takes account of caller expectations (what does the caller feel needs to be done; what were they seeking from ringing the helpline). The caller should feel that the nurse cares about them.

Active listening relates to the nurse giving the caller time to explain the problem; encouraging provision of information; the nurse doesn't interrupt unnecessarily and confirms that the caller's needs are understood by summarising the situation and seeking confirmation from the caller that this is a correct representation of the problem.

Language comprehensibility relates to the degree to which the nurse can be understood or comprehended by the caller, covering aspects such as accent of the nurse, speed of delivery of information, use of plain language (not complex medical terminology) and enunciation (clear, not mumbling, provides smooth flow of information).

Advice - clarity and confirmation relates to the nurse's advice and suggested course of action that is provided to the caller. Are the next steps clearly explained to the caller? Is safety net advice clearly explained? Is the caller's understanding of the advice checked ("Can you repeat back to me what I have suggested that you do now?") and is agreement with the advice confirmed ("Are you able to do this? Do you feel comfortable with this advice?")?

Domain 2a: Client-centredness

	Never	Rarely	About half the time	Usually	Always
Nurse uses caller name	○	○	○	○	○
Tone of voice is professional, calm and respectful	○	○	○	○	○
Nurse is responsive, taking account of caller cues and expectation	○	○	○	○	○
Nurse cares about the caller and their problem	○	○	○	○	○

Domain 2b: Active listening

	Never	Rarely	About half the time	Usually	Always
Caller is given time to explain the problem or tell their story	○	○	○	○	○
Nurse encourages provision of information	○	○	○	○	○
Nurse does not make unnecessary interruptions or talk over the caller	○	○	○	○	○
Nurse confirms understanding of caller need and situation	○	○	○	○	○

Domain 2c: Language comprehensibility

	Never	Rarely	About half the time	Usually	Always
Nurse uses plain English	○	○	○	○	○
Nurse has an understandable accent	○	○	○	○	○
Speed of delivery is appropriate	○	○	○	○	○
Audibility/voice projection/enunciation is appropriate	○	○	○	○	○

Domain 2d: Advice - clarity and confirmation

	No	Yes
Signposting is used	○	○
Action plan or next steps provided	○	○
Confirmation of caller understanding	○	○
Caller agreement with advice	○	○
Safety net advice provided	○	○

Do you wish to make any further notes on the communication in this call?
○ Yes
○ No

Notes

Communication score (/53) - hidden from assessor, for data export only. ______________________

The remainder of the call assessment tool only needs to be completed if there was escalation to a final outcome of "attend ED immediately". Did this call involve escalation to a final disposition of 'attend ED immediately'?

○ Yes ○ No

Domain 3: Factors contributing to a final outcome of 'Attend ED immediately' A key aim of this audit is to determine the reasons why callers do or do not diverge from the advice provided by the nurse. We have included a selection of possible reasons that might lead to an escalation of triage from Final Disposition to Final Outcome, but it is likely that you will come across others in the course of your call assessments, these can be described in the notes box.

It is not essential to add notes if you select one of the pre-determined factors. Keep any notes short, dot points are fine!

Please select "None" if there are no additional identifiable factors influencing the outcome.

Patient factors Select all that apply	☐ Anxiety or nervousness ☐ Prior intention ☐ Frailty or disability ☐ Caring responsibility or needs of dependents ☐ Transport availability ☐ Other ☐ None

Notes: Patient factors

Please provide a brief description of the factor(s) you have selected above, and how they impacted the final outcome of the call.

Nurse factors Select all that apply	☐ Clinical judgement ☐ Assistance not provided to find lower urgency health service ☐ Lack of confidence in patient capacity ☐ Other ☐ None

Notes: Nurse factors

Please provide a brief description of the factor(s) you have selected above, and how they impacted the final outcome of the call.

Health system or service-related factors Select all that apply	☐ Appropriate service not present ☐ Outside health service hours ☐ COVID-19 restrictions impacting health service attendance ☐ Direct cost of attending health service ☐ Indirect cost of attending health service (e.g. travel, time off work) ☐ Other ☐ None

Notes: Health system or service-related factors

Please provide a brief description of the factor(s) you have selected above, and how they impacted the final outcome of the call.

Other factors

If there were other factors influencing the outcome of this call that do not readily fit into patient, nurse or health system or service-related factors, please describe them briefly below.

Please use this space to include any other notes you wish to make about this call.

Re-enter Healthdirect Call ID ______________________________

Please check the Healthdirect Call IDs you have entered. They do not match.

Mismatch? ______________________________

Appendix 2: Sampling Scheme

Description of sampling scheme for healthdirect

In total there were 50487 calls, representing 19137 distinct covariate patterns, with 1-177 triages for each pattern (mean=2.6, median=1). We will focus on two distinct patterns of escalation or pathways (which we will refer to as Case1 and Case2), and aim to compare each of these with two distinct non-escalation patterns or pathways (which we will refer to as Control1 and Control2). These 4 pathways included 20302 calls (40% of the total available) and are described in Table 1 below.

Table 7. Pathways of interest

Nurse clinical judgement

Patient/caller factors

Nurse factors

System/service factors

Pathway 1 (Case1)			**N (%)**
Initial disposition	**Final disposition**	**Final outcome**	
See doctor in 2 hours	Attend ED immediately	Attend ED immediately	963 (4.7)
See doctor in 6 hours			
See doctor in 12 hours			
Pathway 2 (Case2)			
Initial disposition	**Final disposition**	**Final outcome**	
See doctor in 2 hours	See doctor in 2 hours	Attend ED immediately	1328 (6.5)
See doctor in 6 hours	See doctor in 6 hours		
See doctor in 12 hours	See doctor in 12 hours		
Control pathway 1 (Control1)			
Initial disposition	**Final disposition**	**Final outcome**	
See doctor in 2 hours	See doctor in 2 hours	See doctor in 2 hours	9816 (48.4)
See doctor in 6 hours	See doctor in 6 hours	See doctor in 6 hours	
See doctor in 12 hours	See doctor in 12 hours	See doctor in 12 hours	
Control pathway 2 (Control2)			
Initial disposition	**Final disposition**	**Final outcome**	
Attend ED immediately	Attend ED immediately	Attend ED immediately	8195 (40.4)

We would like to sample 296 calls in total, comprising 75 calls from each pathway, within the following criteria.

1) Let each pathway be defined as follows:
    a. Pathway 1: (Initial disposition = See doctor in 2 hours OR See doctor in 6 hours OR See doctor 12 hours) AND (Final disposition = Attend ED immediately) AND (Final outcome = Attend ED immediately).

b. Pathway 2: (Initial disposition = See doctor in 2 hours OR See doctor in 6 hours OR See doctor 12 hours) AND (Final disposition = See doctor in 2 hours OR See doctor in 6 hours OR See doctor 12 hours) AND (Final outcome = Attend ED immediately).

c. Control pathway 1: (Initial disposition = See doctor in 2 hours OR See doctor in 6 hours OR See doctor 12 hours) AND (Final disposition = See doctor in 2 hours OR See doctor in 6 hours OR See doctor 12 hours) AND (Final outcome = See doctor in 2 hours OR See doctor in 6 hours OR See doctor 12 hours).

d. Control pathway 2: (Initial disposition = Attend ED immediately) AND (Final disposition = Attend ED immediately) AND (Final outcome = Attend ED immediately).

2) Keep only those calls in Pathway 1 OR Pathway 2 OR Control pathway 1 OR Control pathway 2

3) Keep only those calls that used guidelines for either limb pain OR vomiting toddler OR abdominal pain in adults. (These are the most common guidelines which are escalated and comprise 24%, 19% and 16% of the cases respectively, covering 60% of total cases.)

4) For each of the four pathways, randomly select 37 calls from metro areas and 37 from rural areas. This is because in our initial analyses, calls from rural areas were much more likely to be escalated, although they comprise only 25-30% of the calls of interest. Sampling equally from metro and rural areas will allow us to assess factors specific to rural calls that may be associated with escalation. It will not allow assessment of whether metro/rural location is associated with escalation because this factor will be evenly distributed between cases and controls, but this has already been assessed in the full sample.

5) Do not aim for a balanced sample in terms of sex, age, jurisdiction, time of day, or Aboriginal status. Within each case/control and rural/metro group, we are aiming to achieve an approximately representative sample in terms of these factors, and this will be best achieved via random sampling with regard to these factors. This will also allow us to investigate the association of these factors with escalation, which will not be possible if samples are balanced for these factors. For example, although afterhours calls were associated with escalation in our initial analyses, such calls comprised over 70% of cases so sufficient afterhours calls will be included without over-sampling.

We expect that this design will achieve the best possible power to assess nurse and patient factors associated with escalation while controlling or adjusting for location (metro/rural), sex, age, jurisdiction, time of day, and Aboriginal status as appropriate. Our initial analyses have shown that location and time of day appear to be the most important predictors of escalation, with age, Aboriginality, sex and jurisdiction also associated for specific guidelines.

Table 3. Required sample size for each combination of factors.

	Case1	**Case2**	**Control1**	**Control2**	**Total**
Metro	37	37	37	37	*148*
Rural	37	37	37	37	*148*
Total	*74*	*74*	*74*	*74*	**296**

Appendix 3: Appropriateness of triage advice – Case Pathways 1 and 2

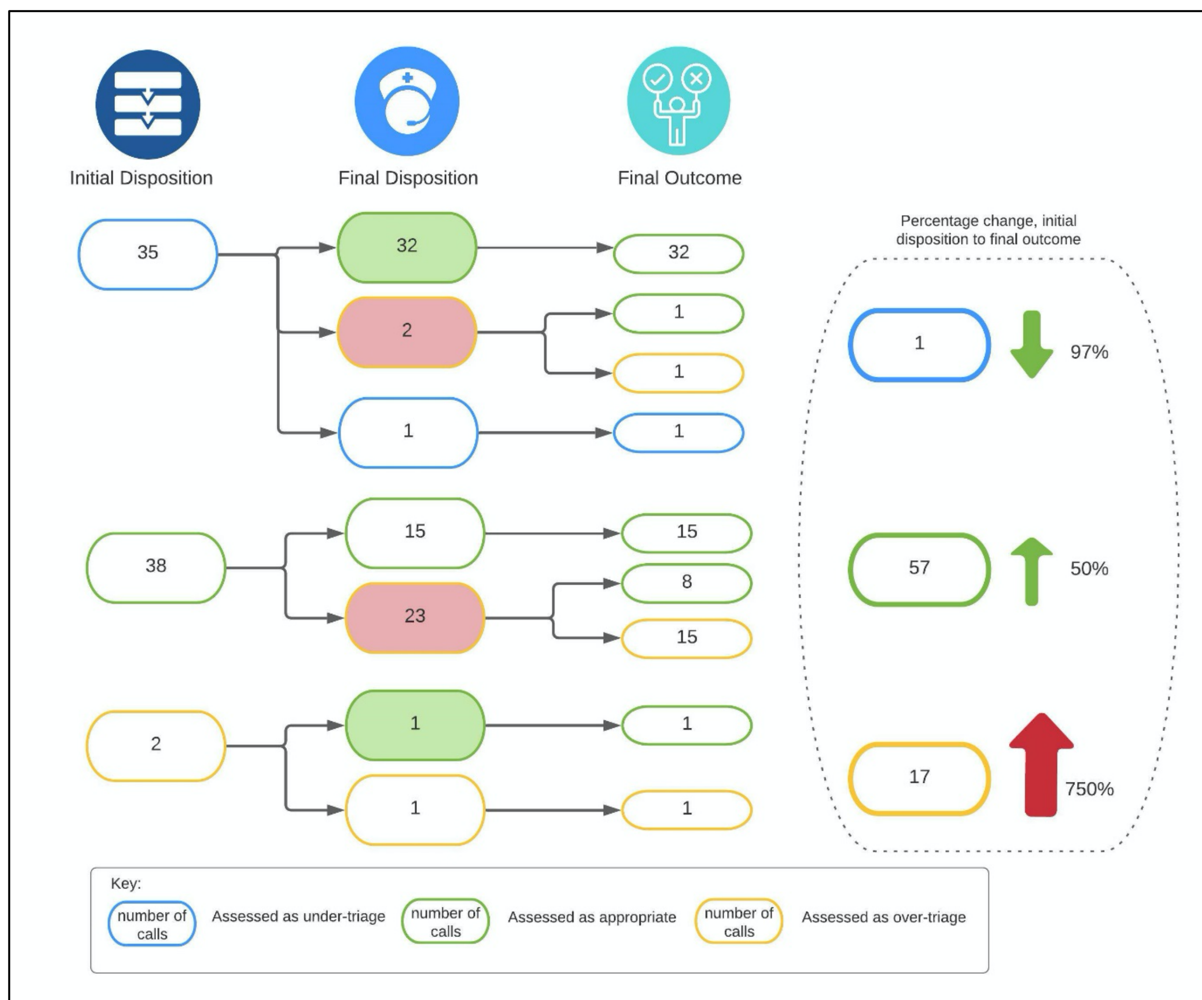

Figure 9. Case pathway 1: change in triage appropriateness initial disposition -> final disposition -> final outcome.

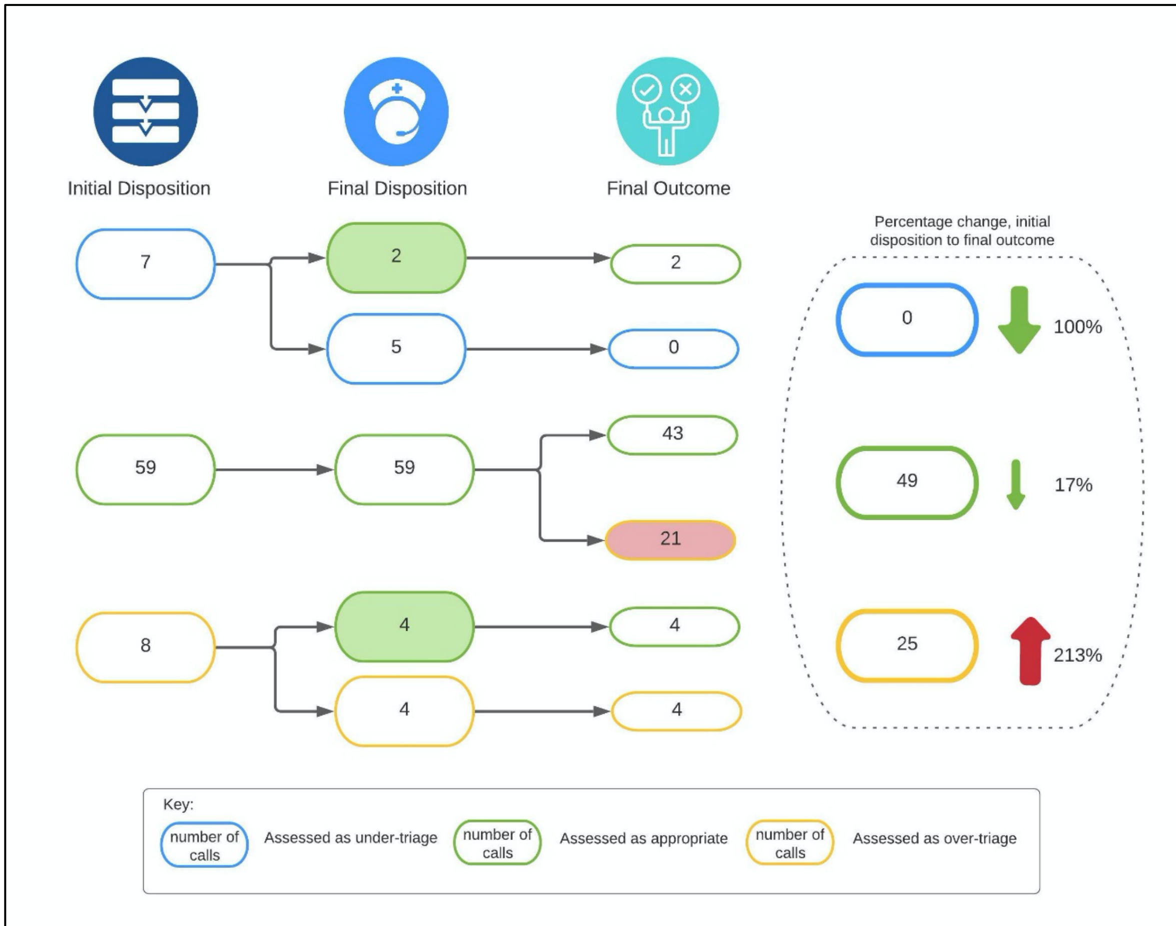

Figure 10. Case pathway 2: change in triage appropriateness initial disposition -> final disposition -> final outcome.