


Study of prehospital video telehealth for callers with mental health-related complaints

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ABSTRACT

Background Patients with mental health-related complaints are a key driver of increasing emergency medical service (EMS) demand; however, they require minimal intervention by EMS personnel. We describe the outcomes of a video telehealth study by mental health nurses (MHNs) in an EMS call-taking centre.

Methods This was a prospective study of adult (≥ 18 years) EMS callers with non-urgent mental health concerns in Victoria, Australia who underwent secondary triage between 1 March 2020 and 31 May 2021. Multivariable logistic regression models were used to compare the influence of video telehealth with voice-only triage by an MHN or secondary triage practitioner on the need for ambulance dispatch. One-week follow-up was conducted with video telehealth patients. Interviews were conducted with MHNs and a cost analysis was performed.

Results A total of 9588 patients were included of which 738 (7.7%) completed video consultation. The median age of video telehealth patients was 34 years (Q1: 24, Q3: 47), 62% were female and the most common complaint was suicidal or self-harm ideation (50.0%). After multivariable adjustment, video telehealth was associated with reduced odds of emergency ambulance dispatch (OR=0.173, 95% CI 0.144 to 0.209) when compared with voice-only triage by a secondary triage practitioner, but not voice-only triage by an MHN (OR=1.009, 95% CI 0.827 to 1.232). Video triage was associated with increased referrals to alternative services (excluding EDs) when compared with voice-only triage by an MHN (OR=1.321, 95% CI 1.087 to 1.606). Among those responding to 1-week follow-up, 92.8% were satisfied with the telehealth service and MHNs viewed it favourably. The average cost per video telehealth case was half that of a traditional secondary triage.

Conclusion The use of video telehealth by MHNs was associated with fewer emergency ambulance dispatches when compared with voice-only triage by secondary triage practitioners, and increased referrals to alternative services. This cost-effective technology was viewed favourably by patients and MHNs. Expansion of video technology in EMS call taking warrants exploration.

INTRODUCTION

Demand for emergency medical services (EMS) is increasing internationally, and patients with mental health-related complaints have been reported as a key driver of this growth.^{1 2} Mental health attendances represent approximately 1 in 10 EMS encounters; however, these patients receive

WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ Patients with mental health-related complaints are a key driver of increasing emergency medical service (EMS) demand; however, they receive minimal intervention by EMS personnel. Some EMS agencies have implemented mental health nurses (MHN) into their call-taking centres to provide a specialist mental health assessment in a time of crisis. Historically, this triage has involved voice-only consultation; however, video consultation may improve patient access to treatment, save healthcare resources and increase cost-efficiency.

WHAT THIS STUDY ADDS

⇒ The use of video telehealth by MHNs in an EMS call-taking centre was associated with fewer emergency ambulance dispatches to patients with mental health complaints when compared with voice-only triage by secondary triage practitioners, and increased referrals to alternative services when compared with voice-only triage by MHNs. The technology was cost-effective and was also viewed favourably by both patients and MHNs.

HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

⇒ Expansion of video technology in EMS call taking to other patient cohorts warrants exploration.

minimal intervention by EMS personnel, and may instead benefit from specialist mental healthcare.^{3 4} Consequently, some EMS agencies internationally have implemented mental health nurses (MHNs), capable of conducting specialised mental health telephone consultation, into their call-taking centres.^{3 5}

Historically, prehospital telephone triage has involved voice-only consultation. However, a growing body of evidence suggests that video consultation with mental health clinicians may improve patient access to treatment, save healthcare resources and increase cost-efficiency.⁶ A recent review also reported that clinical effectiveness and patient satisfaction were similar between mental health patients who received treatment via video telehealth versus in-person care.⁷

Consequently, in 2020 the EMS in Victoria, Australia commenced a study of video telehealth by

MHNs in the secondary triage call-taking centre. Patients with mental health concerns who were initially deemed not to require an emergency ambulance were diverted via secondary triage to an MHN for specialist triage. Patients were offered a video consultation, with the option to decline and undergo traditional voice-only triage if preferred. This study describes the outcomes of the video telehealth study, including triage outcomes, patient and MHN uptake and satisfaction, and cost.

METHODS

Study design

This was a prospective study of adult (≥ 18 years) patients who called the EMS in Victoria, Australia with a non-urgent mental health-related complaint and underwent secondary triage by a secondary triage practitioner or MHN between 1 March 2020 and 31 May 2021. Excluded were patients deemed unsuitable for video triage or those triaged by an MHN at a non-video-capable triage terminal.

Setting

Ambulance Victoria is the state-wide EMS in Victoria, serving a population of >6.5 million people. Emergency calls undergo initial triage by non-clinically trained call takers using the Medical Priority Dispatch System. This triage results in the dispatch of an emergency ambulance or referral to the EMS's secondary triage service.⁸ Secondary triage is conducted by experienced paramedics and nurses who identify the patient's primary complaint then follow semistructured question sets to arrive at a suitable outcome. These outcomes include the provision of self-care advice, referral to an alternative health service or ED, dispatch of a non-emergency patient transport service or dispatch of an emergency ambulance. In cases where the secondary triage practitioner identifies the primary complaint to be mental health related, they may assign the call to an MHN for a specialist assessment. This covers the patient's history, environment and available supports. On completion of the assessment, the MHN may provide self-care advice or refer the patient to any of the services mentioned above. Alternative health services in the setting of mental health include the patient's general practitioner or another specialist mental health practitioner where the patient can receive follow-up and ongoing care. Mental health calls may not be referred to an MHN if the secondary triage practitioner deems it to be unnecessary, the patient is agitated or refuses additional triage or there is another medical condition that also requires triage.

Video telehealth study

The Telemental HEaLth Pilot (Tele-HELP) ran for a 15-month period, commencing 1 March 2020 and ending 31 May 2021. The study aimed to use video telehealth to improve access to mental healthcare and provide a patient-centred experience. The primary outcome was the proportion of video telehealth cases receiving an emergency ambulance when compared with: (a) voice-only triage by MHNs or (b) voice-only triage by secondary triage practitioners. The secondary outcome was the proportion of cases referred to an alternative health service (excluding EDs).

Specialist triage terminals, staffed by MHNs, were available for the study. Video telehealth was initially available 7 days/week during staff working hours (07:30–03:00); however, this increased to 24 hours/day from 14 December 2020. Between 1 March 2020 and 28 February 2021 (12 months) two terminals were available, one with video capabilities and the other with voice-only triage capabilities. From 1 March 2021, an additional

terminal with video capabilities was available. Calls referred to MHNs were assigned to the next available terminal for triage.

Patients assigned to video telehealth-capable terminals were offered video triage if deemed suitable by the MHN. Suitable patients who declined participation, were not offered the technology, or who had connection/device issues were triaged as per traditional voice-only procedures. Video triage was undertaken using GoodSAM's Instant Help platform, an emergency 'appless' video system which enables video streaming between the caller and the MHN. Patients who consented to video telehealth were sent a link via short message service which, on acceptance, initiated a live two-way video stream using the mobile phone camera. When connection issues arose, the decision around whether to continue trying to establish a video connection or to proceed with voice-only triage was made on a case-by-case basis by the MHN and the patient. One week after the triage, patient telephone follow-up surveys were conducted by secondary triage practitioners to measure adherence to any recommended treatments and patient satisfaction with the service.

Data sources

Secondary triage data, including details about the triage clinician, caller suitability for video triage and the triage outcome, are stored within the Ambulance Victoria data warehouse and were extracted for analysis. Data relating specifically to the video triage are stored within a text field and were therefore coded for analysis. Ambulance transport outcomes were also extracted. Estimated costs of secondary triage, ambulance transport and ambulance non-transport were obtained from the Ambulance Victoria accounts department. Telephone follow-up was conducted using the Client Satisfaction Questionnaire-8.⁹ This questionnaire contains eight questions, each with four possible responses, which are designed to assess the level of consumer satisfaction with health services. A semistructured interview was also conducted with two MHNs in November 2020 to discuss their experience with video telehealth up to that time. The interview schedule is provided in the online supplemental table S1.

Definitions

Mental health-related secondary triage complaints included suicide/self-harm, unspecified mental health/psychiatric problems, unusual behaviour, anxiety, depression, hallucinations, anorexia nervosa, bulimia and/or social problems. Triage type was defined as either video telehealth with an MHN, voice-only triage by an MHN (at a video telehealth-capable terminal) or voice-only triage by a secondary triage practitioner. Patients considered unsuitable for video telehealth included those calling from a public place or chaotic scene; those for whom police or ambulance were already on scene; third-party callers; and patients experiencing a psychotic episode, or who were combative or verbally abusive, highly intoxicated, highly distressed or in a suspected domestic violence situation.

Statistical analyses

Categorical operational and patient survey response data are presented as frequencies and proportions. Comparisons across groups are made using the χ^2 test or Fisher's exact test, as appropriate. For categorical variables with multiple levels, the χ^2 test was performed overall for the variable, and for each individual level. Continuous data are presented as median and first and third quartiles, with comparisons across groups made using the Kruskal-Wallis test. To understand the independent association of video telehealth by an MHN on the primary and secondary

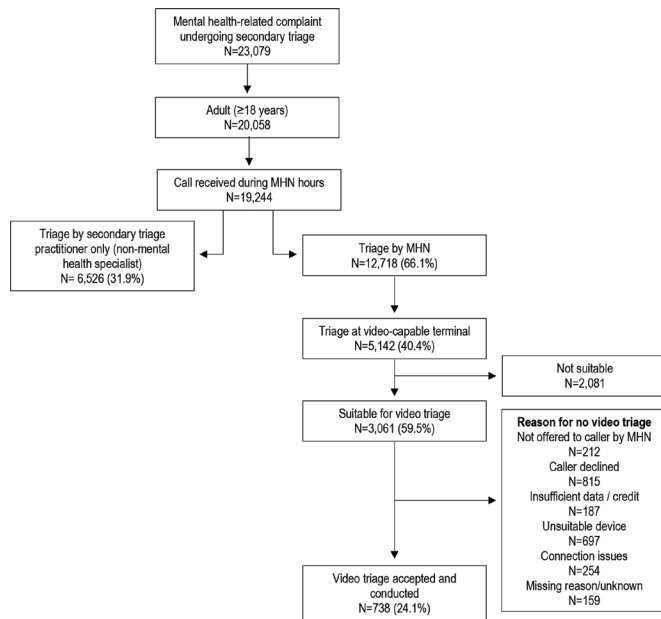


Figure 1 Patient selection flow chart. MHN, mental health nurse.

outcomes, we constructed two multivariable logistic regression models. Each model was adjusted for triage type, patient age (included as a restricted cubic spline with four knots), gender, out-of-hours call, weekend calls, metropolitan residential location and the patient's main mental health complaint. Missing data were excluded from analyses. Results are presented as ORs and 95% CIs.

The semistructured interview conducted with MHNs was recorded, and responses were subsequently summarised. We also performed an analysis to estimate the average cost per case associated with each triage type, accounting for triage duration and call outcomes. The cost of triage was estimated using the minutely salary rate of MHNs or secondary triage practitioners, multiplied by the median duration (in minutes) of each triage type. Ambulance dispatch and transport costs were added to the

cost of triage. To account for the fact that set-up costs of the video technology are not ongoing, we estimated the average cost per video triage both including and excluding set-up expenses. Set-up costs per minute were derived by dividing the total cost of video telehealth set-up by the total number of minutes that MHNs were available during the study period.

Patient and public involvement

The 'Tele-HELP' study steering committee included a consumer representative who provided valuable insights and advice into the pilot design. Patients were invited to participate in a follow-up interview 1 week after their video consultation.

RESULTS

Patient characteristics

A total of 9588 patients were included in analyses of which only 738 (7.7%) completed a video consultation (figure 1). The monthly proportion of triages which involved video telehealth over the study period is presented in online supplemental figure S1. Video use declined during the first 4 months from 6.7% in March 2020 to 1.5% in June 2020. After this, use of the technology increased; however, it fluctuated seasonally.

Baseline characteristics are presented in table 1 according to triage type. Video telehealth patients were younger and more often female when compared with patients who underwent voice-only triage by either an MHN or secondary triage practitioner ($p < 0.001$ for both). The median total triage duration for video telehealth patients was 39.7 (Q1, Q3: 30.3, 52.4) min, which was longer than the duration of voice-only triage with an MHN (31.0 (22.8, 42.5) min) or a secondary triage practitioner (11.8 (8.1, 17.5) min). The most common presenting complaint for video telehealth patients was suicidal or self-harm ideation (50.0%), followed by unspecified mental health problems (21.0%) and anxiety or depression (19.5%).

Case outcomes

Video telehealth patients were less likely to require an emergency ambulance dispatch when compared with patients who

Table 1 Characteristics of mental health calls undergoing secondary triage

	Overall N=9588	Video telehealth by MHN N=738	Voice-only triage by MHN N=2324	Voice-only triage by secondary triage practitioner N=6526	P value
Age (years), median (Q1, Q3)	40 (28, 56)	34 (24, 47)	37 (27, 50)	42 (28, 61)	<0.001
Female gender, n (%)	5082 (53.6)	451 (61.7)	1227 (53.3)	3404 (52.8)	<0.001
Out of hours (17:00–07:00), n (%)	4848 (50.6)	362 (49.1)	1120 (48.2)	3366 (51.6)	0.014
Weekend, n (%)	2692 (28.1)	235 (31.8)	691 (29.7)	1766 (27.1)	0.003
Metropolitan region, n (%)	8872 (97.0)	682 (95.8)	2171 (97.4)	6019 (97.0)	0.1
Missing	441	26	94	321	–
Secondary triage call duration (min), median (Q1, Q3)	16.1 (9.7, 28.7)	39.7 (30.3, 52.4)	31.0 (22.8, 42.5)	11.8 (8.1, 17.5)	<0.001
Main complaint, n (%)*					
Suicidal/self-harm ideation	3646 (38.0)	369 (50.0)	1141 (49.1)	2136 (32.7)	<0.001
Mental health problem (unspecified)	2335 (24.4)	155 (21.0)	512 (22.0)	1668 (25.6)	<0.001
Behavioural problem	1454 (15.2)	43 (5.8)	152 (6.5)	1259 (19.3)	<0.001
Anxiety/depression	1472 (15.4)	144 (19.5)	407 (17.5)	921 (14.1)	<0.001
Hallucinations/hearing things	386 (4.0)	21 (2.9)	91 (3.9)	274 (4.2)	0.2
Social problems/other	295 (3.1)	6 (0.8)	21 (0.9)	268 (4.1)	<0.001

Proportions exclude missing data.
*Overall χ^2 test: $p < 0.001$.
MHN, mental health nurse; Q1, quartile 1; Q3, quartile 3.

Table 2 Case outcomes

	Overall N=9588	Video telehealth by MHN N=738	Voice-only triage by MHN N=2324	Voice-only triage by secondary triage practitioner N=6526	P value
Triage outcomes, n (%)*					
Emergency ambulance dispatched	4911 (51.2)	192 (26.1)	599 (25.8)	4120 (63.1)	<0.001
Non-emergency patient transport arranged	707 (7.4)	47 (6.4)	165 (7.1)	495 (7.6)	0.4
Referred to alternative service	1571 (16.4)	224 (30.4)	590 (25.4)	757 (11.6)	<0.001
Advised to self-present to ED/taxi arranged	1544 (16.1)	172 (23.3)	591 (25.4)	781 (12.0)	<0.001
Provided self-care advice	790 (8.2)	100 (13.6)	348 (15.0)	342 (5.2)	<0.001
Managed as per care plan	65 (0.7)	3 (0.4)	31 (1.3)	31 (0.5)	<0.001
Transported to ED by emergency ambulance after triage					
n (% of all cases)	3541 (36.9)	146 (19.8)	414 (17.8)	2981 (45.7)	<0.001
n (% of cases with an emergency ambulance dispatch)	3541 (72.1)	146 (76.0)	414 (69.1)	2981 (72.4)	0.1

*Overall χ^2 test: $p < 0.001$.
MHN, mental health nurse.

underwent voice-only triage by a secondary triage practitioner (26.1% vs 63.1%, $p < 0.001$, table 2). They were also more likely to be referred to an alternative health service for follow-up when compared with voice-only triage by an MHN (30.4% vs 25.4%, $p = 0.008$) or secondary triage practitioner (30.4% vs 11.6%, $p < 0.001$). Among patients dispatched an emergency ambulance by an MHN, a higher proportion of transport to hospital was observed when video telehealth was used (76.0% vs 69.1% for voice-only triage by MHN, $p = 0.066$).

Multivariable analyses

After adjustment for confounders, video telehealth was associated with an 83% reduction in the odds of emergency ambulance dispatch (OR=0.173, 95% CI 0.144 to 0.209) when compared with voice-only triage by a secondary triage practitioner (table 3). When compared with voice-only triage by an MHN, video telehealth was not associated with a significant reduction in emergency ambulance dispatch (OR=1.009, 95% CI 0.827 to 1.232); however, it was associated with an increase in referral to alternative health services (OR=1.321, 95% CI 1.087 to 1.606).

Patient satisfaction

Of the 738 video telehealth patients, 389 consented to 1-week follow-up. Of these, 129 (33.2%) responded to the survey. Overall, 91.2% of responders agreed they received the help they wanted via video telehealth (figure 2 and online supplemental figure S2), and 92.8% were 'very satisfied' or 'mostly satisfied' with the service. In total, 89.4% of responders stated they would likely use video telehealth again if they were to seek help in the future.

MHN experience and participant uptake

MHNs generally described video telehealth as a positive addition to their triage. They stated that video telehealth improved patient assessment through the addition of visual cues, while also enabling better engagement with the caller. They also stated that the technology enabled face-to-face interaction when patients were unable to access other mental health services. Despite these advantages, ending the call was occasionally challenging due to the high level of patient-clinician engagement, and this likely

Table 3 Independent association of video telehealth on emergency ambulance dispatch and referral to an alternative service

	Emergency ambulance dispatch		Referral to alternative service	
	OR (95% CI)	P value	OR (95% CI)	P value
Triage group				
Voice-only triage by secondary triage practitioner	Ref		Ref	
Video telehealth by MHN	0.173 (0.144 to 0.209)	<0.001	3.788 (3.128 to 4.586)	<0.001
Voice-only triage by MHN	0.172 (0.153 to 0.193)	<0.001	2.867 (2.508 to 3.277)	<0.001
Age (per year)	0.970 (0.946 to 0.993)	0.012	1.027 (0.995 to 1.060)	0.1
Male gender	0.996 (0.906 to 1.094)	0.1	0.965 (0.857 to 1.086)	0.6
Out-of-hours call	0.783 (0.713 to 0.860)	<0.001	1.216 (1.081 to 1.369)	0.001
Metropolitan location	1.241 (0.947 to 1.626)	0.1	0.703 (0.516 to 0.958)	0.025
Main complaint				
Anxiety/depression	Ref		Ref	
Suicidal/self-harm ideation	5.762 (4.934 to 6.730)	<0.001	0.258 (0.221 to 0.303)	<0.001
Mental health problem (unspecified)	4.464 (3.801 to 5.242)	<0.001	0.366 (0.310 to 0.432)	<0.001
Behavioural problem	7.660 (6.374 to 9.207)	<0.001	0.243 (0.195 to 0.303)	<0.001
Hallucinations/hearing things	4.016 (3.106 to 5.194)	<0.001	0.216 (0.150 to 0.312)	<0.001
Social problems/other	0.615 (0.442 to 0.857)	0.004	1.137 (0.853 to 1.515)	0.3

n=9058 included in each model.
MHN, mental health nurse; Ref, reference category.

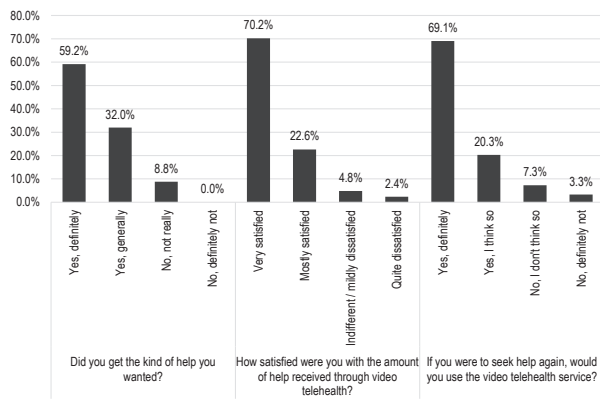


Figure 2 Patient satisfaction with video telehealth. Results are based on n=125, n=123 and n=123 responses, respectively.

contributed to longer triage durations. The MHNs interviewed reported that among the wider MHN group, there were differing views on which patients were suitable for video triage, as well as the level of comfort and safety they felt in using the technology.

Uptake of video telehealth was generally quite low with only 24.1% of suitable patients completing a video consultation (figure 1). A total of 26.6% of suitable patients declined the offer. Uptake was hampered in the early phase of the study by local technology issues such as problems with connectivity and video quality, as well as issues finding time for MHN training. However, MHNs reported that implementation of more streamlined processes and procedures throughout the study increased their engagement and made video triage simpler.

Cost analysis

Table 4 presents the results of the cost analysis which accounts for triage duration as well as ambulance dispatch and transport. A detailed description of expenses is outlined in online supplemental table S2. The estimated average cost per video telehealth case, including set-up expenses, was \$A468.9. When set-up expenses were excluded, the average cost was \$A465.4. Video triage was half the cost of voice-only triage by a secondary triage practitioner (\$A970.8), although comparable to the average cost per case of voice-only triage by an MHN (\$A437.9).

DISCUSSION

To our knowledge, this is one of the first studies to examine the use of video telehealth in a prehospital call-taking centre,

particularly in the setting of mental health. Despite relatively low uptake of video triage overall, our study demonstrated several benefits. First, when compared with voice-only triage by an MHN, video telehealth was associated with a 32% increase in the odds of referral to alternative services for ongoing care. Second, when compared with voice-only triage by secondary triage practitioners, it was associated with an 83% reduction in the odds of emergency ambulance dispatch. Third, most patients who underwent a video consultation and responded to follow-up were satisfied with the service and stated that they would use it again, while MHNs viewed the technology favourably.

Recently, authors have argued that more or better community mental health services may help ease the burden of increasing demand on EMS.^{3,4} While this may be the case, in a time of crisis, patients may find they have no alternative but to call EMS.¹⁰ Despite longer total triage durations, our study demonstrated a number of benefits of MHN triage, regardless of their use of video telehealth. First, MHNs provide a specialist service which is available 24 hours/day, 7 days/week. Second, triage by an MHN was associated with fewer emergency ambulance dispatches when compared with triage by a secondary triage practitioner, thereby increasing ambulance resource availability. Third, the average cost per case was less than half that of a traditional secondary triage. However, one advantage of video triage over voice-only triage by MHNs may be increased specificity of triage outcome. Among patients who were dispatched an emergency ambulance by an MHN, we observed a higher rate of transport to hospital when video telehealth was used. This finding may indicate that patients who received an emergency ambulance were genuinely more likely to require transport to hospital. In addition, video triage was associated with increased odds of referral to follow-up services for ongoing mental health-care. Although not assessed in our study, the influence of this on recontacts with EMS warrants investigation.

In our study, uptake of video telehealth was generally low, with many patients declining to participate or experiencing technological issues. MHN engagement during the early phase of the study was also impacted by technological issues, training delays and the COVID-19 pandemic. Stay-at-home restrictions meant that the project team were unable to attend the secondary triage service and rectify issues and/or engage with MHNs as effectively as initially planned. Over the course of the study, technological issues were rectified, MHN engagement increased and uptake of video triage improved. Additionally, the EMS ensured that new MHNs were informed of the video technology during recruitment. Nevertheless, the decision to offer

Table 4 Cost per mental health case undergoing secondary triage

	Video telehealth by MHN, including set-up costs		Video telehealth by MHN, excluding set-up costs		Voice-only triage by MHN		Voice-only triage by secondary triage practitioner	
	Cost (\$A)	% of n=738	Cost (\$A)	% of n=738	Cost (\$A)	% of n=2324	Cost (\$A)	% of n=6526
Triage only*	49.23	67.6	45.66	67.6	35.65	67.1	12.04	29.3
Triage+emergency ambulance transport	1775.23	19.8	1771.66	19.8	1761.65	17.8	1738.04	45.7
Triage+emergency ambulance without transport	812.23	6.2	808.66	6.2	798.65	8.0	775.04	17.5
Triage+non-emergency patient transport	528.23	6.4	524.66	6.4	514.65	7.1	491.04	7.6
Average cost per case	\$A468.9		\$A465.4		\$A437.9		\$A970.8	

*Includes provision of self-care advice or referral to an alternative health service /ED. MHN, mental health nurse.

video triage was ultimately made by MHNs at their own discretion, and this may have been influenced by differing views on patient suitability. Further, due to the increased triage duration and data capture requirements of video triage, use of the technology was sometimes impractical during periods of high EMS demand.

There are several learnings from our study that may be of interest to EMS agencies. Allocating time for MHN training was challenging, and this may have been overcome through a dedicated training opportunity or the development of a training video. Additionally, data capture at the conclusion of the video triage increased MHN workload, and this process could be simplified to increase MHN availability as well as reduce coding requirements for analysis. Finally, agreeing on a clear definition of suitable patients may help enhance clinician comfort with the process and increase use of the technology.

In the face of increasing EMS demand, novel strategies to improve ambulance resource availability are needed. One previous study described the use of video consultation in an emergency call-taking centre.¹¹ In that report, video triage technology was implemented for low-acuity 'hear and treat' consultations in the UK. Like our study, clinical staff believed the technology improved clinical assessment, and patients viewed it favourably. Callers who received a video consultation also had a lower rate of recontact with the ambulance service in the following 24 hours than callers who received telephone triage alone.

Our study has some limitations. The response rate to 1-week follow-up was 33% and this may give rise to selection bias, limiting the generalisability of our results. Further, we did not perform follow-up interviews with patients who underwent voice-only triage by MHNs and therefore cannot compare the patient experience between triage groups. Only two MHNs were available to participate in semistructured interviews, and it is therefore unlikely that thematic saturation regarding MHN experiences was reached. The final triage outcomes reflect the outcome at the end of the video or telephone consultation. It is possible that this outcome was changed after the end of the call, for example, in instances of limited resource availability. Although we assessed the average operating cost per case, we did not assess patients managed per triage practitioner. Finally, due to data limitations, we were unable to exclude third-party callers or cases involving police from the 'voice-only triage by a secondary triage practitioner' subgroup, and this may bias our analyses.

CONCLUSION

The use of video telehealth by MHNs during EMS secondary triage was associated with fewer emergency ambulance dispatches when compared with voice-only triage by secondary triage practitioners, and increased referrals to alternative services when compared with voice-only triage by MHNs. This cost-effective technology was also viewed favourably by patients and clinicians. Expansion of video technology in EMS call taking to other patient cohorts warrants exploration.

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Contributors KS conceived the study. NM, EN and GB collected the data. EN conducted the literature search, drafted the manuscript, performed the statistical analyses and acts as guarantor of the work. All authors contributed to data interpretation, reviewed the manuscript and made critical revisions for intellectual property.

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Competing interests None declared.

Patient and public involvement Patients and/or the public were involved in the design, or conduct, or reporting, or dissemination plans of this research. Refer to the Methods section for further details.

Patient consent for publication Not applicable.

Ethics approval This study involves human participants and was approved by the Monash University Human Research Ethics Committee (22784). Participants gave informed consent to participate in the study before taking part.

Provenance and peer review Not commissioned; externally peer reviewed.

Data availability statement Data are available upon reasonable request. Data are available upon reasonable request to the corresponding author.

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A study of prehospital video telehealth for callers with mental health-related complaints

Supplementary Appendix

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*Corresponding author

Table S1: MHN semi-structured interview schedule

<i>Topic 1: Utilisation and suitability</i>	<ul style="list-style-type: none"> ▶ Please discuss differences between patients who were offered versus not offered video triage. ▶ Which mental health presentations are most appropriate for video triage? What are the typical presentations for which video triage works well? ▶ Which presentations are inappropriate for video triage and why? ▶ Consent: What is the main reason patients do not agree to video triage? ▶ Triage duration: Does video triage take longer than the voice-only triage? If so, why? ▶ Provide any further comments on the utilisation and suitability of video triage.
<i>Topic 2: Technology and training</i>	<ul style="list-style-type: none"> ▶ Did you receive adequate training for use of video triage? Please provide any suggestions for improving video triage training. ▶ How reliable was the technology? Please describe any issues that have arisen with the video link sending, audio, and connection. ▶ Data collection: Please describe the ease of data entry. Are any additional fields required / should any fields be removed?
<i>Topic 3: Patient and staff safety</i>	<ul style="list-style-type: none"> ▶ Do you feel safe conducting video triage with patients? Please discuss / describe any situations in which you felt uncomfortable using video triage. ▶ Are you aware of any adverse events experienced by patients following video triage? ▶ Do you have any recommendations to improve MHN and / or patient safety?
<i>Topic 4: Patient and staff experience / satisfaction</i>	<ul style="list-style-type: none"> ▶ Do you think the video technology improves the patient experience? Provide a brief explanation of the benefits and / or challenges, including ease of use. ▶ From a clinical perspective, does video triage assist in triaging the patient and assessing the scene? Provide a brief explanation of the benefits and / or challenges. ▶ Patient satisfaction survey: Have patients been open to providing details for follow-up? Please describe the patients that aren't suitable for follow-up. Do you have any suggestions to improve the follow-up process?

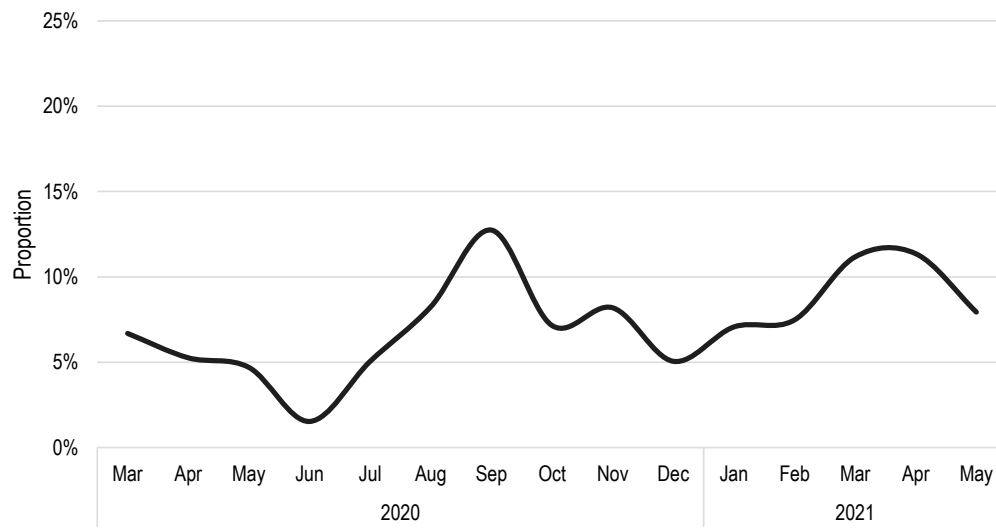
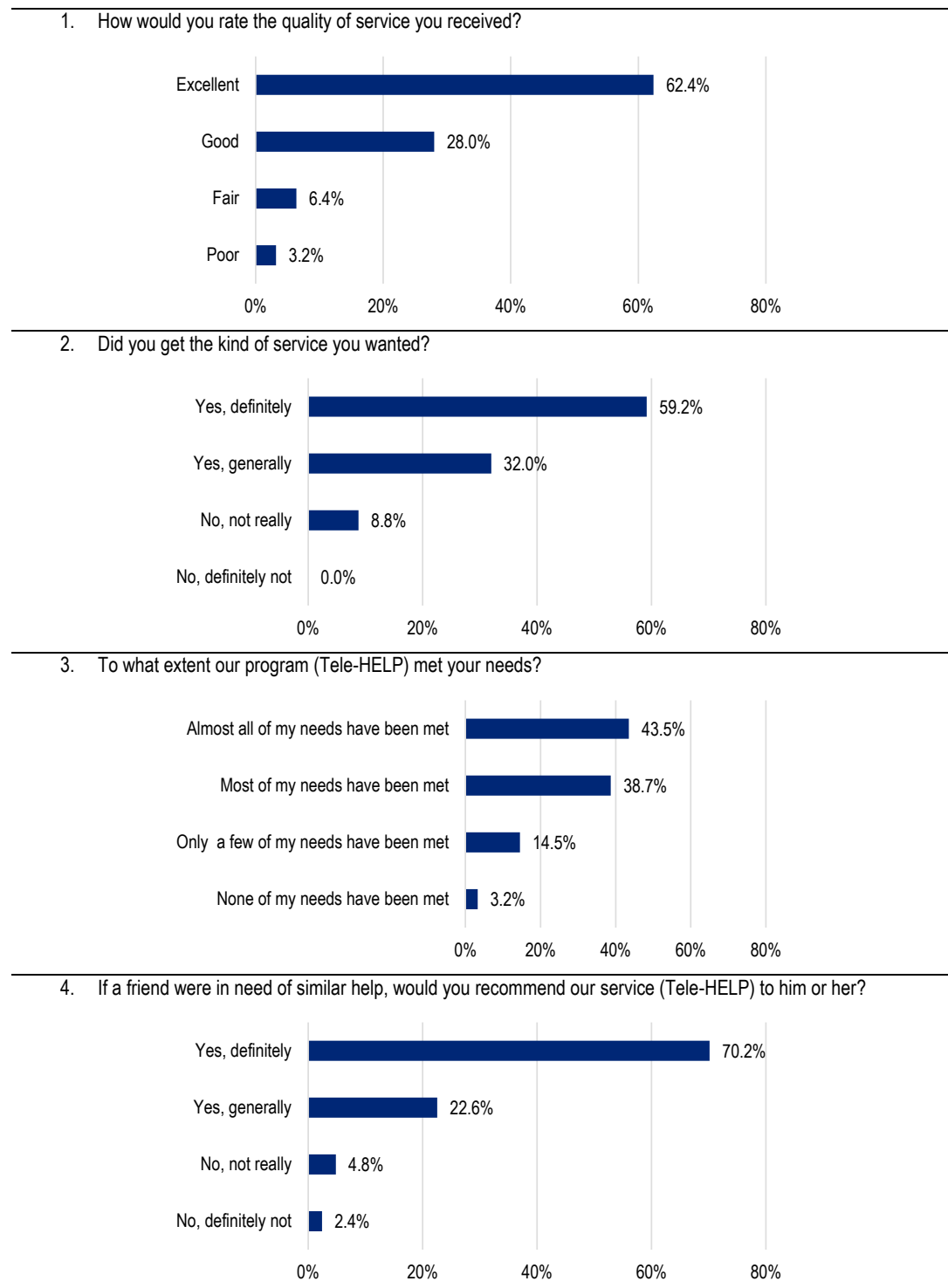
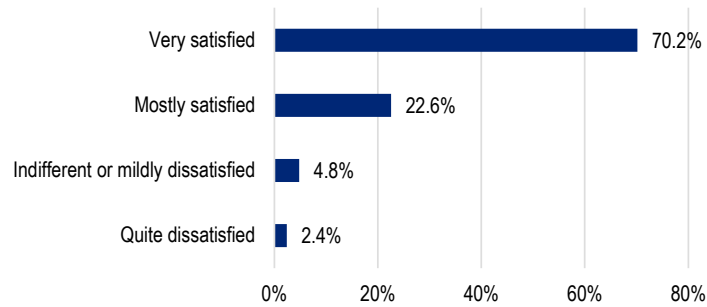
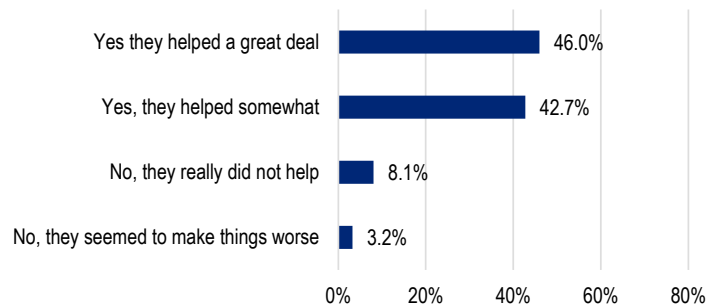
Figure S1: Monthly proportion of included patients who underwent video triage

Figure S2: Client Satisfaction Questionnaire (CSQ-8) Results

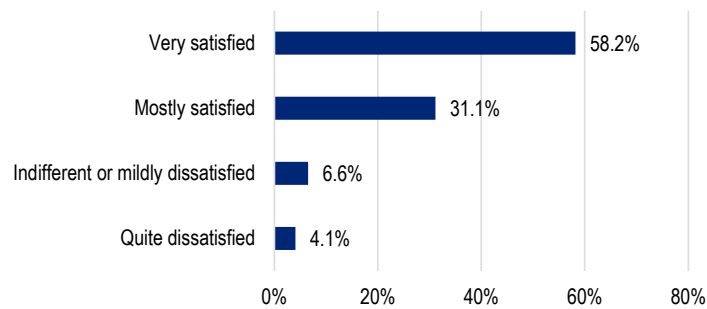
5. How satisfied are you with the amount of help you have received?



6. Have the services you received helped you to deal more effectively with your problems?



7. In an overall general sense how satisfied are you with the service you have received?



8. If you were to seek help again, would you come back to our program?

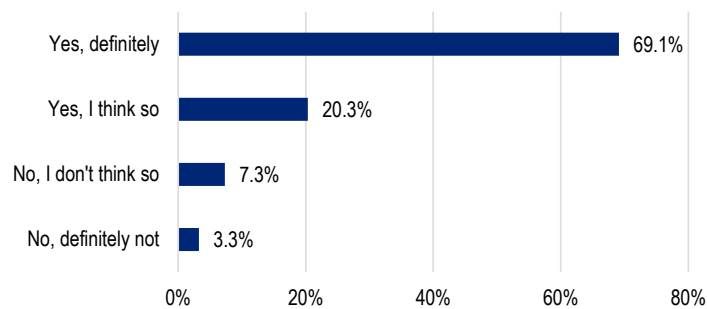


Table S2: Summary of costs

Video telehealth set-up	Costs (AU \$)
Salaries and on-costs (includes: Program Manager and Research Assistant, as well as management time from the Secondary Triage Service, GoodSAM and Information Technology)	In-kind time by existing EMS staff
GoodSAM installation and video storage	37,000.00
Information technology hardware [^]	1,000.00
Data capture template development	12,000.00
Total	50,000.00
Cost per minute of the study (580,320 minutes*)	0.09
Operating costs	
MHN salary per minute	1.15
Secondary triage practitioner salary per minute	1.02
Emergency ambulance dispatch with transport to hospital	1,726.00
Emergency ambulance dispatch without transport to hospital	763.00
Non-emergency ambulance transport to hospital	479.00
Average operating cost per case type	
MHN video triage, including set-up costs	
MHN video triage for a median of 39.7 minutes	$39.7 * (1.15+0.09) = 49.23$
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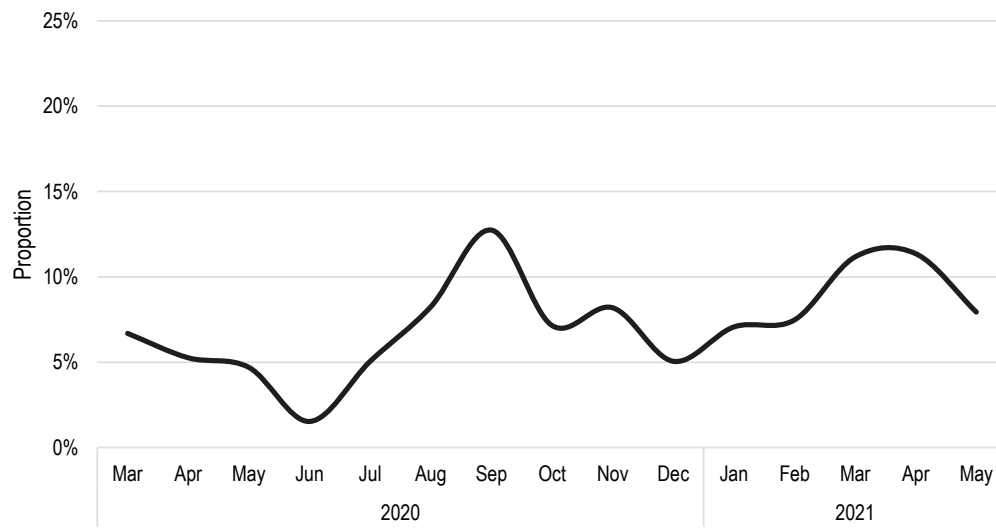
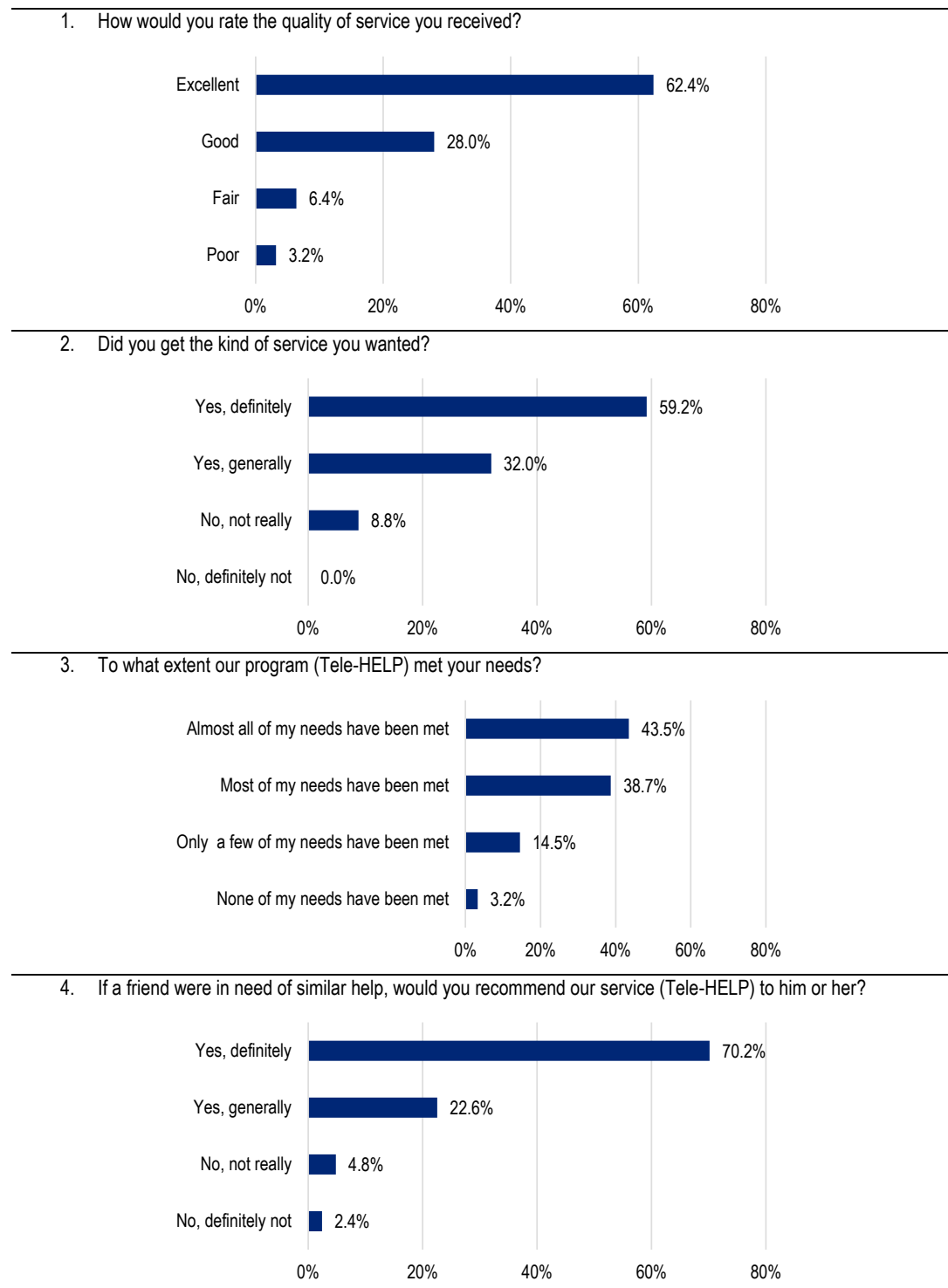
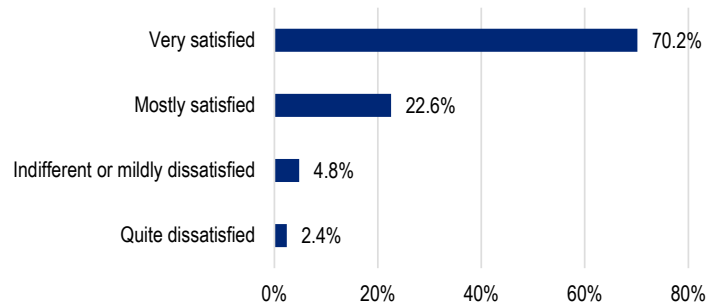
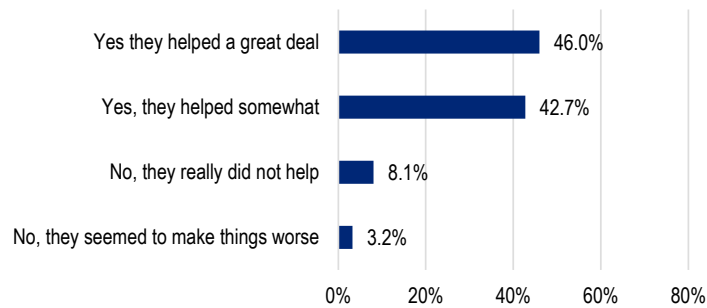
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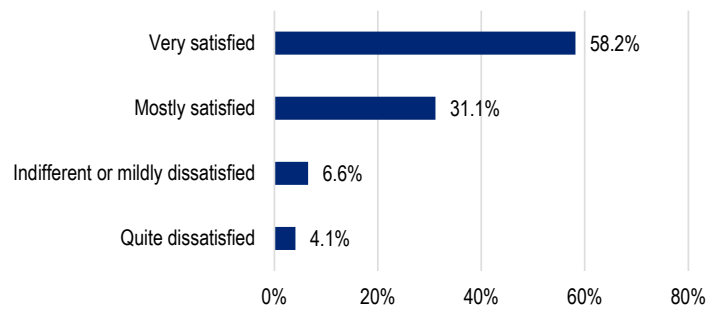
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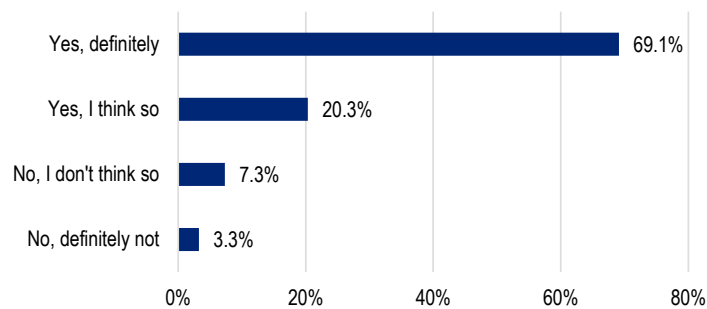


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