RESUSCITATION PLUS 15 (2023) 100434

Available online at www.sciencedirect.com

Resuscitation Plus

journal homepage: www.elsevier.com/locate/resuscitation-plus

Clinical paper

Comparison of outcomes of out-of-hospital cardiac arrest patients: Emergency calls placed from mobile phones vs. landline phones

Takeshi Nishimura[a,b], Masafumi Suga[a,b], Takashi Hongo[a], Tetsuya Yumoto[a], Atsunori Nakao[a], Satoshi Ishihara[b], Hiromichi Naito[a,]*

Abstract

Background: Until recently, calls to the emergency medical service (EMS) from landline phones, which display the caller's exact location at the dispatch center, had been common. Since the use of mobile phones has become widespread, many emergency calls are now made from mobile phones. Differences in outcomes of out-of-hospital cardiac arrest (OHCA) patients for whom EMS was called from mobile versus landline phones has not yet been fully elucidated.

Methods: We performed a retrospective, population-based analysis in Kobe, Japan to examine whether EMS calls from mobiles improved the prognosis of OHCA patients over EMS calls placed from landlines. The primary outcome was favorable neurological outcome, defined as Cerebral Performance Category (CPC) scores of 1 or 2 at discharge. Secondary outcomes were survival at one-month, survival at discharge, and time durations between call and EMS activities.

Results: Of 4,231 OHCA cases, 2,194 cases (706 landline cases vs. 1,488 mobile cases) were included in this study. The percentages of favorable neurological outcomes were 0.7% (5/706) in the landline group and 3.8% (56/1,488) in the mobile group. Adjusted multivariable logistic regression revealed that favorable neurological outcomes (odds ratio [OR] 3.03, 95% confidence interval [CI] 1.12–8.17, $p = 0.03$) were better in the mobile group, while one-month survival (OR 1.30, 95% CI 0.80–2.14, $p = 0.29$) was not significantly different. Bystander CPR was more frequently administered in the mobile group (landlines 61.3% vs. mobiles 68.4%, $p < 0.01$). Time durations between call to EMS dispatch (184.5 [IQR 157–220 s] vs. 205 [IQR 174–248 s], $p < 0.01$) and EMS arrival (476.5 [IQR 377–599 s] vs. 491 [IQR 407.5–611.5 s], $p < 0.01$) were shorter in the landline group.

Conclusions: Although the landline caller location display system seems effective for shorter times between EMS call and EMS arrival, mobile phone use was associated with better neurological outcomes.

Keywords: Cardiac arrest, OHCA, CPR

Introduction

To improve outcomes of out-of-hospital cardiac arrest (OHCA) patients, early recognition and intervention are critical. Remarkably, cardiopulmonary resuscitation (CPR) performed by bystanders has been demonstrated to significantly improve survival from OHCA.[1–4] Once emergency medical dispatchers recognize a patient presenting with cardiac arrest, they can give CPR instructions to bystanders over the phone. Instruction through the telephone is considered to boost the frequency of bystander CPR, and dispatcher-assisted CPR may improve OHCA outcomes.[5–7] Thus, phone calls to the emergency medical service (EMS) play an important role in the chain of survival.

Traditionally, landline phones had been the primary means used to call ambulances. In Japan, when the EMS system receives a call, a "landline caller location display system" immediately detects the caller's address from the phone number and displays that location at the dispatch center. This system may contribute to quick dispatch and early EMS arrival at the location, particularly when the patient's condition suddenly changes and becomes unconscious while calling EMS or caller panic. Mobile phones have some advantages; hands-

* Corresponding author at: Department of Emergency, Critical Care, and Disaster Medicine, Okayama University Graduate School of Medicine, Dentistry, and Pharmaceutical Sciences, 2-5-1 Shikata, Okayama 700-8558, Japan.

E-mail address: naito-hiromichi@s.okayama-u.ac.jp (H. Naito).

https://doi.org/10.1016/j.resplu.2023.100434

Received 4 June 2023; Received in revised form 11 July 2023; Accepted 13 July 2023

free CPR can be conducted in speaker mode near the patient, which enables the dispatcher to give online feedback during CPR. On the other hand, mobile phones present several inconveniences, such as the inability to reverse locate the caller, poor reception signals, and battery drainage.

Although rare, several studies dichotomizing and comparing OHCA outcomes for landline vs. mobile phones have been conducted. Maeda *et al*. reported that emergency calls made using mobile phones improved survival from OHCA. Their results were not adjusted for factors known to predict OHCA survival such as age and place of cardiac arrest.[8] Huang *et al*. demonstrated that dispatcher-assisted CPR instructed via mobile calls over landline calls resulted in higher CPR rates and shorter call to chest compression time.[9] However, this study did not address EMS activities and outcomes for OHCA patients.

More recently, with the increasingly widespread use of mobile phones and the resulting decrease in landline phone use, it is important to update these findings dichotomizing outcomes for landline vs. mobile phones. Accordingly, this study aims to elucidate whether EMS calls placed from mobile phones compared to those placed from landline phones affects the outcomes of OHCA patients and key factors associated with successful resuscitation such as time durations between call to bystander CPR, EMS dispatch, EMS arrival, and EMS hospital arrival with adjusted known risk factors.

Materials and methods

Study design and data collection

This was a retrospective, population-based cohort study conducted in Kobe city, Japan, on cases treated from January 1, 2019 to December 31, 2021. Kobe city covers an area of 557 km^2 and 1.5 million residents from regions including both rural and urban communities. Data from all OHCA patients who were treated by EMS personnel in the city and transported to hospitals were collected using the Utstein style.[10] All OHCA cases transported by EMS during the time period were included in the study. Cases associated with calls that were not directly made to EMS (i.e., via police, coast guard, etc.), EMS-witnessed cardiac arrest, and missing primary outcome data were excluded. We also excluded cases associated with calls made using Voice over Internet Protocol (VoIP), since VoIP uses a broadband Internet connection instead of a standard phone line and is often unable to distinguish between calls made from landlines vs. mobile phones. The Hyogo Emergency Medical Center Ethics Committee approved the study protocol (2022008). The requirement for informed consent was waived, as all information that could identify patients in the present study was removed.

EMS system in Japan

EMS personnel are activated by dialing 119 to reach the local fire department. While EMS calls from landlines show the exact location of the caller based on their phone number, EMS calls from mobile phones display the caller's rough location as detected by global positioning system (GPS). The EMS team is dispatched immediately based on this location information. An EMS team comprising more than three ambulance crew members is dispatched from the closest fire station to administer emergency care to OHCA patients. At least one emergency life-saving technician is required to be on the EMS team. Emergency life-saving technicians are authorized to place supraglottic airways and intravenous access and use semiautomated external defibrillators (AED) to rescue OHCA patients, and specially trained emergency life-saving technicians are allowed to perform endotracheal intubation and administer adrenaline. Nearly all OHCA patients were sent to the closest emergency hospital; EMS personnel in Japan are not permitted to stop resuscitation at the scene or during transport once resuscitation is initiated.

The study data included the following OHCA patient characteristics: age, sex, date of admission, place of cardiac arrest (residence, nursing home, public space), initial electrocardiogram, estimated cardiac cause, bystander CPR, prehospital treatment (endotracheal intubation/supraglottic device, AED, adrenaline), estimated time of bystander CPR initiation obtained from bystander's statement, time of EMS call, time of EMS dispatch, time of EMS arrival at the scene, time of EMS arrival at the hospital, survival at one month, survival at discharge, and Cerebral Performance Category (CPC) scores at discharge, which are used to evaluate neurological outcomes.[11]

We compared two OHCA groups: the mobile phone group, where the first EMS call came from a mobile phone, and the landline phone group, where the first EMS call came from a landline phone. The primary outcome was favorable neurological outcome at hospital discharge. Secondary outcomes were as follows: survival at one month, survival at discharge, and time durations for EMS activities such as duration between call to bystander CPR, call to EMS dispatch, call to EMS arrival, and call to EMS hospital arrival. This study defined favorable neurological outcome as CPC scores of 1 (good cerebral performance: conscious, alert, able to work) or 2 (moderate cerebral disability: conscious, sufficient cerebral function for independent activities of daily life), and poor outcomes as CPC scores of 3 (severe cerebral disability: dependent on others for daily support because of impaired brain function), 4 (coma or vegetative state: any degree of coma without the presence of all brain death criteria), and 5 (brain death: apnea, areflexia, electroencephalogram silence).[12]

Data analysis

We used descriptive statistics to characterize the study population. We described continuous variables using mean and standard deviation (SD). Discrete variables were described using median and interquartile range (IQR). Categorical variables were described using percentages. We used the student t test to compare continuous variables and the chi square test to compare categorical variables.

We performed multivariable logistic regression using favorable neurological outcomes at discharge, survival at one month, and survival at discharge as the dependent variable and mobile phone use over landline phone use as the independent variable, adjusting for age, sex, witnessed cardiac arrest, bystander CPR, shockable rhythm, and cardiac arrest location (public space or non-public space). Time durations for EMS activity were compared with Mann-Whitney U test. We described the results of logistic regression using odds ratios (OR) and 95% confidence intervals (CI). Statistical analysis was performed using STATA/IC 15 (StataCorp, Lakeway, TX, USA).

Results

Patient flowchart & Baseline characteristics

From 4,231 patients, after excluding 155 patients with indirect EMS calls placed from the scene, 1,676 VoIP call patients, 205 EMS-witnessed patients, and one patient with missing prognosis at discharge, a total of 2,194 patients were included in the study. Of those patients, 706 patients were in the landline group and 1,488 patients were in the mobile group (Fig. 1).

Patient characteristics are shown in Table 1. Patients in the landline group were likely to be older than those in the mobile group (landlines 80.1 [SD 13.0] vs. mobiles 70.9 [SD 19.7], $p < 0.01$). The number of mobile phone calls increased every year, while the number of landline phone calls decreased. OHCA in nursing homes occurred more frequently in the landline group (landlines 14.6% [103/706] vs. mobiles 8.7% [129/1,488], $p < 0.01$), while OHCA in public spaces was more often seen in the mobile group (landlines 8.5% [60/706] vs. mobiles 22.4% [333/1,488], $p < 0.01$). The proportion of bystander-witnessed cardiac arrest did not differ (landlines 41.6% [294/706] vs. mobiles 40.7% [606/1,488], $p = 0.68$). Bystander CPR was more frequently administered in the mobile group (landlines 61.3% [433/706] vs. mobiles 68.4% [1,018/1,488], $p < 0.01$). There was no statistical difference in CPR prior to call (landlines 46.2% [326/706] vs. mobiles 49.1% [730/1,488], $p = 0.21$).

Primary and secondary outcomes results are shown in Table 2. Logistic regression adjusted for age, sex, witnessed cardiac arrest, bystander CPR, shockable rhythm, and place of cardiac arrest revealed that mobile phone use was significantly associated with favorable CPC scores (landlines 0.7% [5/706] vs. mobiles 3.8% [58/1,488], OR 3.03, 95% CI 1.12–8.17, $p = 0.03$) (Fig. 2). However, survival at one month (landlines 4.2% [30/706] vs. mobiles 7.7% [114/1,488], OR 1.30, 95% CI 0.82–2.07, $p = 0.27$) and survival at discharge (landlines 4.1% [29/706] vs. mobiles 7.6% [113/1,488], OR 1.33, 95% CI 0.83–2.14, $p = 0.23$) did not differ.

Time durations of EMS activities between call to EMS dispatch (landlines 184.5 s [IQR 157 to 220] vs. mobiles 205 s [IQR 174 to 248], $p < 0.01$), and call to EMS arrival (landlines 476.5 s [IQR 377 to 599] vs. mobiles 491 s [IQR 407.5 to 611.5], $p < 0.01$) were longer in the mobile group; however, time duration between call to bystander CPR (landlines –22 s [IQR −45 to 1] vs. mobiles −20 s [IQR −42 to 20], $p = 0.05$) and call to EMS hospital arrival (landlines 1,711 s [IQR 1,452 to 2,077] vs. mobiles 1,738 s [IQR 1,432 to 2,109], $p = 0.47$) did not differ.

Discussion

Our results demonstrate that mobile phone use was associated with the improvement of neurological outcomes; however, survival at one month and at discharge did not differ. While similar topics have been previously described,[8,9] literature on this subject is scarce.

We found that EMS calls were placed more frequently from mobile phones, and neurological outcomes were better in the mobile group. Of interest, 46.2% of bystanders in the landline group and 49.1% in the mobile group performed CPR prior to EMS call, showing that almost half of OHCA patients immediately received bystander CPR after being found in cardiac arrest. CPR spontaneously initiated by laypersons prior to EMS call was reported to be associated with a higher survival rate.[13] In this study, a higher proportion of bystander CPR in the mobile group might have led to better neurological outcomes. Accordingly, differing characteristics between mobile phones and landline phones should be considered by EMS system personnel, and appropriate utilization depending on the situation is recommended.

The use of mobile phones, in particular smartphones, has become more prevalent in the most recent decade. During the study period, the prevalence of smartphone use reached 88.6% in 2021 in Japan.[14] As technology has advanced, smartphone apps and methods to provide qualified CPR have been developed. Providing advanced cardiac life support in the prehospital setting with direct medical intervention through remote video calls to paramedics has improved survival and neurological outcomes.[15] With the spread of smartphone use, EMS calls placed from mobile phones will continue to increase.

EMS calls from mobile phones tended to delay EMS dispatch and EMS arrival, because unlike when EMS is called from a landline phone, it was impossible to instantly know the patient's exact location since location information could only be obtained via GPS.[8] Also, people calling in public on a mobile phone may not know exactly where they are located and it may take longer for EMS to obtain the address. These differences in the location process are the main reasons for the prolonged time duration. To shorten these gaps, further improvement of GPS accuracy is warranted.

A recent European Resuscitation Council Guideline recommends that a single bystander with a mobile phone should dial the EMS number, turn on the mobile phone's speaker or other hands-free option, and immediately begin CPR following assistance from the dispatcher if the person is unconscious and not breathing or breathing abnormally.[16] These functions are by default equipped on mobile phones and can be easily added as an option for wireless landline phones. The disadvantage of landline phones is that a rescuer may not be at patient's side during the call, while wireless landline

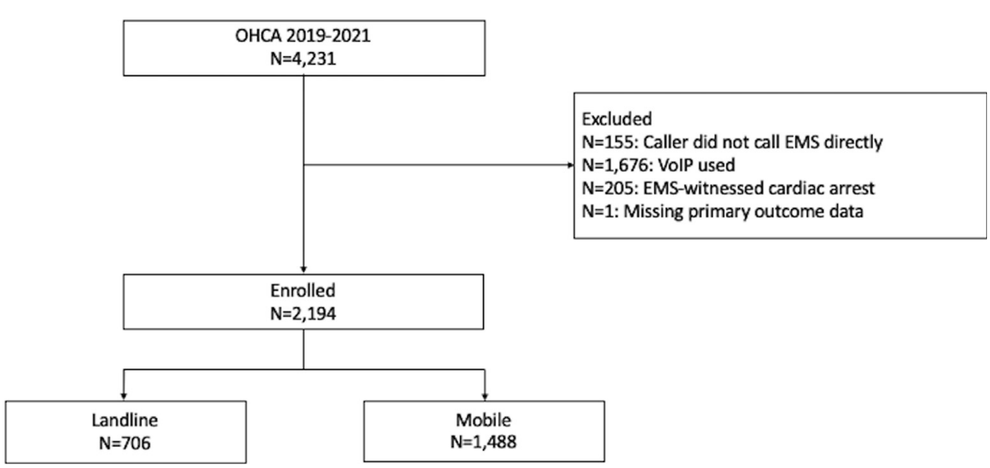

Fig. 1 – Flow chart for patients analyzed in the study.

Table 1 – Baseline patient characteristics.

		Landline N = 706	Mobile N = 1,488	P value
Age, mean (SD)		80.1 (13.0)	70.9 (19.7)	<0.01
Sex, male		402 (56.9)	882 (59.3)	0.30
Year	2019	270 (38.2)	429 (28.8)	<0.01
	2020	224 (31.7)	518 (34.8)	–
	2021	212 (30.0)	541 (36.4)	–
Place	Residence	543 (76.9)	1,026 (69.0)	<0.01
	Nursing home	103 (14.6)	129 (8.7)	<0.01
	Public space	60 (8.5)	333 (22.4)	<0.01
Initial ECG	Asystole	498 (70.5)	1,006 (67.6)	0.17
	VF/pulseless VT	37 (5.2)	94 (6.3)	0.32
	PEA	158 (22.4)	351 (23.6)	0.53
	Other	13 (1.8)	37 (2.5)	–
Origin	Cardiac	279 (39.5)	611 (41.1)	0.49
Bystander witnessed	Yes	294 (41.6)	606 (40.7)	0.68
Bystander CPR	Yes	433 (61.3)	1,018 (68.4)	<0.01
CPR prior to call	Yes	326 (46.2)	730 (49.1)	0.21
Prehospital	ETI/LT	292 (41.4)	606 (40.7)	0.78
	Adrenaline	145 (20.5)	244 (16.4)	0.08
	AED	34 (4.8)	69 (4.6)	0.85

Abbreviations: SD, standard deviation; ECG, electrocardiogram; VF/pulseless VT, ventricular fibrillation/pulseless ventricular tachycardia; PEA pulseless electrical activity; CPR, cardiopulmonary resuscitation; ETI/LT, endotracheal intubation/laryngeal tube; AED, automated external defibrillator.

Table 2 – Comparison of neurological outcomes, one month survival, survival at discharge, and duration of EMS activity between landline and mobile phone cases.

		Total N = 2,194	Landline N = 706	Mobile N = 1,488	Adjusted OR (95% CI)*	p value
Favorable neurological outcome at discharge (%)		61 (2.8)	5 (0.7)	56 (3.8)	3.03 (1.12–8.17)	0.03
Survival (%)	at one month	144 (6.6)	30 (4.2)	114 (7.7)	1.30 (0.82–2.07)	0.27
	at discharge	142 (6.5)	29 (4.1)	113 (7.6)	1.33 (0.83–2.14)	0.23
Time duration, s, IQR						
	Call – Bystander CPR	−21 (−43 to 14)	−22 (−45 to 1)	−20 (−42 to 20)	–	0.05†
	Call – EMS Dispatch	198 (168–240)	184.5 (157–220)	205 (174–248)	–	<0.01†
	Call – EMS arrival	487 (399–607)	476.5 (377–599)	491 (407.5–611.5)	–	<0.01†
	Call – Hospital	1,729 (1,438–2,102)	1,711 (1,452–2,077)	1,738 (1,432–2,109)	–	0.47†

Multivariable logistic regression analysis adjusted for age, sex, witnessed cardiac arrest, bystander CPR, shockable rhythm, and place of cardiac arrest revealed a significant difference in favorable neurological outcome; however, there was no difference in one month survival between the MP group and the LP group. Time between call to EMS dispatch and call to EMS arrival were longer in the MP group. Time duration between call to bystander CPR and call to EMS hospital arrival did not significantly differ.

Abbreviations: IQR, interquartile range; EMS, emergency medical services; OR, odds ratio; CI, confidence interval; CPR, cardiopulmonary resuscitation.

handsets allow bystander CPR to be performed. However, elderly bystanders often do not know how to turn on speakers on the handsets.[17] A single rescue by an elderly layperson is a quite common situation, and it is a tough challenge for these elderly laypersons to treat OHCA patients.[18]

Limitations

Our study has several limitations. First, this was a retrospective, population-based cohort study conducted in an urban city, which may have caused information bias. This study is based on the Utstein style, and we could not obtain data for long-term mortality/neurological outcomes. Second, information on callers/dispatchers was absent in this study. Third, since our original data lacked information on the exact locations where the cardiac arrests happened, the distances between the cardiac arrest scenes and the local fire departments were not considered in this study. Fourth, the COVID-19 pandemic, which began in January 2021 in Japan and strongly influenced emergency medicine, coincided with the study period. Preventive measures against COVID-19 during the pandemic, including social distancing, might have decreased rapid bystander assistance for OHCA patients[19] and increased the mortality of elderly people, especially those in nursing homes.

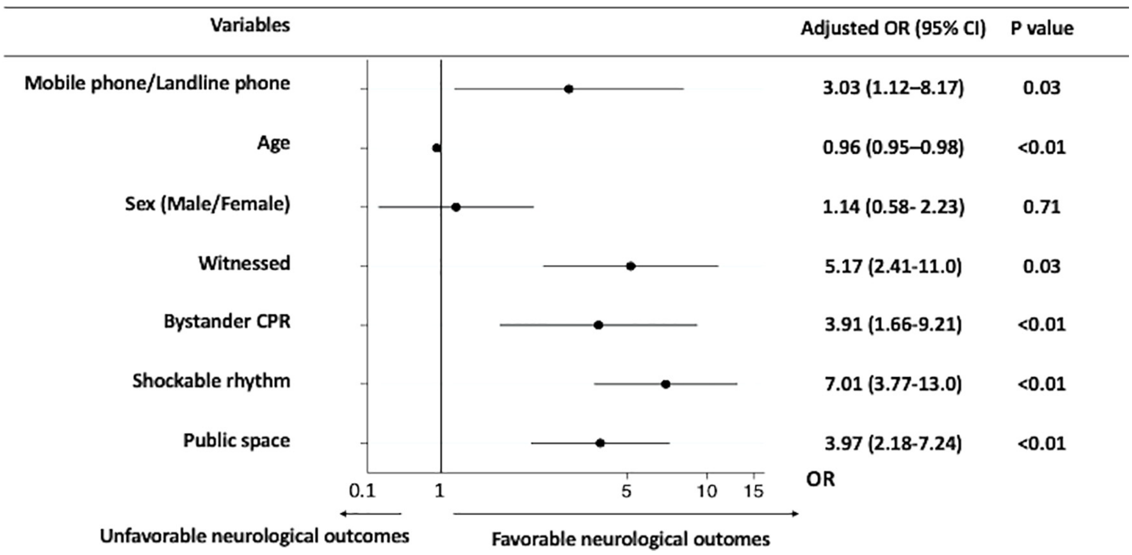

Fig. 2 – Full logistic regression models used in this study. We performed multivariable logistic regression using favorable neurological outcomes at discharge and mobile phone use over landline phone use as the independent variable, adjusting for age, sex, witnessed cardiac arrest, bystander CPR, shockable rhythm, and cardiac arrest location (public space or non-public space). Mobile phone use was associated with favorable neurological outcomes (OR 3.03, 95% CI 1.12–8.17, p = 0.03).

Conclusions

We examined the impact of mobile phone use compared to landline phone use among OHCA patients. Mobile phone use was associated with better neurological outcomes. Although the landline caller location display system seems effective for shorter time between EMS call and EMS arrival, survival did not differ between the groups.

Authors' contributions

T.N., M.S., T.H, T.Y, A.N., S.I., and H.N. all participated in the study design and the acquisition, analysis, and interpretation of the data. All authors were actively involved in the drafting and critical revision of the manuscript.

Disclosure

Approval of the research protocol: Approved by the Hyogo Emergency Medical Center Ethics Committee (2022008).

Informed consent: N/A.

Registry and the registration no. of the study/trial: N/A.

Animal studies: N/A.

Conflict of interest: N/A.

Consent for publication

Consent for publication was waived.

Availability of data and materials

The data for the study is obtained from Kobe city EMS.

Funding

None.

CRediT authorship contribution statement

Takeshi Nishimura: Investigation, Conceptualization, Methodology, Writing – original draft. **Masafumi Suga:** Writing – review & editing. **Takashi Hongo:** Writing – review & editing. **Tetsuya Yumoto:** Writing – review & editing. **Atsunori Nakao:** Writing – review & editing. **Satoshi Ishihara:** Writing – review & editing. **Hiromichi Naito:** Conceptualization, Methodology, Writing – review & editing, Supervision.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgements

The authors thank Christine Burr for editing the manuscript. We thank Dr. Takashi Yorifuji for advice of the statistical analysis.

Author details

[a]Department of Emergency, Critical Care, and Disaster Medicine, Okayama University Graduate School of Medicine, Dentistry, and Pharmaceutical Sciences, Japan [b]Department of Emergency and Critical Care Medicine, Hyogo Emergency Medical Center, Japan

REFERENCES

1. Nikolaou N, Dainty KN, Couper K, et al. A systematic review and meta-analysis of the effect of dispatcher-assisted CPR on outcomes from sudden cardiac arrest in adults and children. Resuscitation 2019;138:82–105.
2. Chocron R, Jobe J, Guan S, et al. Bystander cardiopulmonary resuscitation quality: potential for improvements in cardiac arrest resuscitation. J Am Heart Assoc 2021;10 e017930.
3. Noel L, Jaeger D, Baert V, Debaty G, Genin M, Sadoune S, et al. Effect of bystander CPR initiated by a dispatch centre following out-of-hospital cardiac arrest on 30-day survival: Adjusted results from the French National Cardiac Arrest Registry. Resuscitation 2019;144:91–8.
4. Aldridge ES, Perera N, Ball S, Finn J, Bray J. A scoping review to determine the barriers and facilitators to initiation and performance of bystander cardiopulmonary resuscitation during emergency calls. Resusc Plus 2022;11 100290.
5. Culley LL, Clark JJ, Eisenberg MS, Larsen MP. Dispatcher-assisted telephone CPR: common delays and time standards for delivery. Ann Emerg Med 1991;20:362–6.
6. Tanaka Y, Taniguchi J, Wato Y, Yoshida Y, Inaba H. The continuous quality improvement project for telephone-assisted instruction of cardiopulmonary resuscitation increased the incidence of bystander CPR and improved the outcomes of out-of-hospital cardiac arrests. Resuscitation 2012;83:1235–41.
7. Nurmi J, Pettila V, Biber B, Kuisma M, Komulainen R, Castren M. Effect of protocol compliance to cardiac arrest identification by emergency medical dispatchers. Resuscitation 2006;70:463–9.
8. Maeda T, Yamashita A, Myojo Y, Wato Y, Inaba H. Augmented survival of out-of-hospital cardiac arrest victims with the use of mobile phones for emergency communication under the DA-CPR protocol getting information from callers beside the victim. Resuscitation 2016;107:80–7.
9. Huang SK, Chen CY, Shih HM, et al. Dispatcher-assisted cardiopulmonary resuscitation: differential effects of landline, Mobile, and transferred calls. Resuscitation 2020;146:96–102.
10. Perkins GD, Jacobs IG, Nadkarni VM, et al. Cardiac arrest and cardiopulmonary resuscitation outcome reports: update of the Utstein Resuscitation Registry Templates for Out-of-Hospital Cardiac Arrest: a statement for healthcare professionals from a task force of the International Liaison Committee on Resuscitation (American Heart Association, European Resuscitation Council, Australian and New Zealand Council on Resuscitation, Heart and Stroke Foundation of Canada, InterAmerican Heart Foundation, Resuscitation Council of Southern Africa, Resuscitation Council of Asia); and the American Heart Association Emergency Cardiovascular Care Committee and the Council on Cardiopulmonary, Critical Care, Perioperative and Resuscitation. Circulation 2015;132:1286–300.
11. McKenzie N, Ball S, Bailey P, et al. Neurological outcome in adult out-of-hospital cardiac arrest – not all doom and gloom! Resuscitation 2021;167:227–32.
12. Ajam K, Gold LS, Beck SS, Damon S, Phelps R, Rea TD. Reliability of the Cerebral Performance Category to classify neurological status among survivors of ventricular fibrillation arrest: a cohort study. Scand J Trauma Resusc Emerg Med 2011;19:38.
13. Riva G, Jonsson M, Ringh M, Claesson A, Djarv T, Forsberg S, et al. Survival after dispatcher-assisted cardiopulmonary resuscitation in out-of-hospital cardiac arrest. Resuscitation 2020;157:195–201.
14. Ministry of Internal Affairs and Communications, Japan. White Paper: Information and Communications in Japan 2021 (summary). https://www.soumu.go.jp/main_sosiki/joho_tsusin/eng/whitepaper/2021/index.html.
15. Kim C, Choi HJ, Moon H, Kim G, Lee C, Cho JS, et al. Prehospital advanced cardiac life support by EMT with a smartphone-based direct medical control for nursing home cardiac arrest. Am J Emerg Med 2019;37:585–9.
16. Perkins GD, Graesner JT, Semeraro F, Olasveengen T, Soar J, Lott C, et al. European resuscitation council guidelines 2021: executive summary. Resuscitation 2021;161:1–60.
17. Birkenes TS, Myklebust H, Kramer-Johansen J. Time delays and capability of elderly to activate speaker function for continuous telephone CPR. Scand J Trauma Resusc Emerg Med 2013;21:40.
18. Hauff SR, Rea TD, Culley LL, Kerry F, Becker L, Eisenberg MS. Factors impeding dispatcher-assisted telephone cardiopulmonary resuscitation. Ann Emerg Med 2003;42:731–7.
19. Elmer J, Okubo M, Guyette FX, Martin-Gill C. Indirect effects of COVID-19 on OHCA in a low prevalence region. Resuscitation 2020;156:282–3.