

# Evolution of Bystander Intention to Perform Resuscitation since last Training: an Online Survey

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## Research article

**Keywords:** out-of-hospital cardiac arrest, cardiopulmonary resuscitation, basic life support, confidence, first aid, bystander, behavior

**Posted Date:** September 30th, 2020

**DOI:** <https://doi.org/10.21203/rs.3.rs-67667/v1>

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# Abstract

## Background

According to the theory of planned behaviour, the probability of executing an action is strongly linked to the intention of performing it. The aim of this study was to measure the variation over time of the three dimensions of the intention to perform resuscitation, i.e. attitude, subjective normative beliefs, and control beliefs.

## Methods

The two largest companies delivering first aid courses in the region of Geneva, Switzerland, sent invitation e-mails on our behalf to people who had followed a first aid course in the last five years. Participants were asked to answer a set of 17 psychometric questions designed to assess each dimension of the intention to perform resuscitation. The primary outcome was the change in each dimension at 6 months. Secondary outcomes were the change in each dimension at one and two years and change in each individual question at 6 months, one year and two years.

## Results

Out of 270 completed surveys, 204 were analysed. Control beliefs was the only dimension that displayed a significant change at 6 months ( $p < 0.001$ ). Participants who had followed their last BLS course more than 6 months ago were however more prone to diffusion of responsibility, a key element of subjective normative beliefs ( $p = 0.001$ ). Fear of legal action was higher in participants who had followed their last BLS course more than 2 years ago ( $p = 0.040$ ).

## Conclusions

Control belief, a dimension of the intention to perform resuscitation, rapidly decreases after the last first aid course.

## Background

Survival after out-of-hospital cardiac arrest (OHCA) ranges around 10% in Europe, with recent studies still showing marked differences between regions [1]. Bystander-initiated cardiopulmonary resuscitation (CPR) is one of the most important factors explaining these differences and has been shown to increase the survival rate by three times [1–3]. Immediate CPR initiation after collapse is particularly important, as there is a 10% decrease in survival rate for every minute spent without CPR [4]. In spite of its significant benefit, and though more than half of OHCA are witnessed, CPR is only provided in less than half of victims, with rates varying widely from 6.3–78.0% [1]. As ambulances rarely arrive on scene before 10 minutes, the probability of survival is limited unless CPR has been initiated before the arrival of professional rescuers [4, 5].

According to the theory of planned behaviour, the probability of executing an action is strongly linked to the intention of performing it [6, 7]. Intention is determined by three distinct dimensions [8]. The first, *attitude*, relates to the bystander's beliefs. Regarding resuscitation, a positive attitude would be to think that performing CPR could save a life. The second dimension, *subjective normative beliefs*, is the person's perception of the judgement close relatives might have regarding one's actions. In our context, it would be to think that one's friends would approve, or even be proud, if one performed resuscitation. The third and last dimension, *control beliefs*, is the confidence in one's own ability of performing a resuscitation [6, 7].

In Switzerland, the rates of successful OHCA resuscitation vary from 10–17% [1, 9]. These rates are not as high as could be expected given the rather high proportion of people having followed a CPR training course, which is mandatory to obtain a driving license in this country. This could be explained, at least in part, by the fact that BLS participants lose both skills and confidence in their ability to perform CPR in a matter of weeks after a CPR training course [10–12]. We hypothesized that intention to perform CPR might also decrease over time, thereby further decreasing the rate of bystander-initiated resuscitation and consequently of successful OHCA resuscitations.

The aim of this study was to measure the variation over time of the three dimensions of the intention to perform CPR. Any significant difference could potentially help design specific interventions and hopefully improve the rate of bystander-initiated resuscitation.

## Methods

### Study design

This was a closed web-based study following the CHERRIES [13] guidelines and conducted between January and April 2019. The regional ethics committee issued a non-objection statement (ID 2018 – 01382) as such surveys do not come within the scope of the Swiss federal act on research involving human beings [14].

### Survey design

A first set of general questions was created in order to gather demographic data, determine the time elapsed since the last CPR training course, and record information regarding the number of prior CPR courses followed. A set of 17 psychometric questions was then designed to assess each dimension of the intention to perform CPR (Supplementary Table 1). Ten questions were adapted from the Canadian national survey performed by Vaillancourt et al. in 2013 [6]. Seven more questions were created in order to assess specific factors that could further affect the dimensions of the intention to perform CPR and might therefore prevent bystanders from starting CPR. Among these latter factors, usually referred to as “barriers”, fear of disease, fear of incorrectly performing CPR and fear of hurting the victim were evaluated [15–17]. Answers to all psychometric questions were based on a 4-point Likert scale (“I totally agree”, “I agree”, “I partially agree” and “I don't agree”).

## Technical aspects

A website based on the Joomla! 3.9 content management system (Open Source Matters, New York, USA) was specifically designed for this study. The Community Surveys 5 component (CoreJoomla, Hyderabad, India) was used to create the online survey and record the answers in an encrypted MariaDB 5.5.5 database (MariaDB Corporation AB, California, USA) located on a Swiss server. As this was a closed study, and in order to ensure irreversible anonymization, we decided not to use either cookies or IP address restrictions. A log search was nevertheless performed to identify potential duplicate entries.

The survey itself was displayed over four pages. The first two pages were designed to gather demographic data. The 17 questions were displayed over pages 3 and 4, which contained 9 and 8 questions, respectively. The system ensured that participants had answered all the questions on a page before allowing them to move forwards. All answers could be reviewed and changed as long as the survey was not finalized.

The survey and the data extraction mechanism were thoroughly tested by all the investigators prior to the launch of the study.

## Participants

The two largest companies providing first aid courses in Geneva (the Association Genevoise des Sections de Samaritains, a Red Cross-affiliated national society, and Firstmed, a privately-owned company) were asked for a list of e-mail addresses of former CPR course participants. In order to protect their data, both societies refused to send us such a list but agreed to dispatch e-mails on behalf of the investigators. They were therefore provided with a generic e-mail containing summarized information about the study along with the link to the online survey (Supplementary Material 2).

Upon loading, the website immediately displayed a summarized consent form and a confidentiality notice as well as a link to a detailed description of the study. A statement regarding data collection and storage was also shown, and the purpose and duration of the survey detailed. Participants were informed that they could decide to leave the study at any time, and were given an e-mail address they could use to contact the investigators. No personal data was collected.

Healthcare professionals, students of healthcare professions, and participants who had not followed a CPR course during the previous 5 years were excluded. No financial incentive was given to participate in this study.

## Data curation and availability

Survey data was extracted to a comma-separated value file and imported in Stata (Stata Corp LLC, College Station, Texas, USA). Records were searched for potential duplicate entries as per our protocol. Incomplete surveys, as well as those meeting exclusion criteria, were excluded from analysis.

## Availability of data and materials

The dataset supporting the conclusions of this article is available in the Mendeley Data repository [18].

## Outcomes

The primary outcome was the change in each of the three dimensions of the intention to perform resuscitation between the participants who had completed their last basic life support (BLS) course since less or more than 6 months. The investigators decided to use a 6-month cut-off as asking lay people to attend an on-site refresher course so soon after the last training course would be unlikely. Nevertheless, offering a short, targeted, and portable intervention after this time span might be considered.

Secondary outcomes were the change in each of these dimensions at one and at two years after the course, as well as the change in each individual question at 6 months, one year and two years.

## Statistical analysis

Stata 16.0 was used for statistical analysis. The answers were grouped as “negative” (“I partially agree” and “I don’t agree”) or “positive” (“I totally agree” and “I agree”).

A score of 1 point was attributed when the answer (whether negative or positive) was in favour of the intention to perform resuscitation. All survey questions carried the same weight and were summed by dimension, therefore producing a continuous variable. Student’s t-test was used to assess differences between the different dimensions of the intention to perform resuscitation. Fisher’s exact test was used to assess categorical and binary variables. Results are expressed as median (Q1:Q3). A double-sided p value < 0.05 was considered significant.

## Results

Emails were sent between January and April 2019. Though the exact number of sent and “bouncing” emails had been asked for, these data could not be gathered as one of the two companies experienced technical problems with their mailing system. Reminders could not be sent as per the wish of both companies.

Overall, 383 surveys were started, out of which 270 (70.5%) were completed. A total of 204 surveys (75.6%) were analysed after application of the exclusion criteria (Fig. 1). No data suggestive of duplicate entry was identified.

Characteristics of the participants, including the number of prior BLS courses, are described in Table 1.

Table 1  
Characteristics of study participants.

	< 6 months	> 6 months	<i>P</i> value
Education, n (%)			0.045
Mandatory education	3 (4%)	3 (3%)	
Professional diploma	18 (21%)	34 (29%)	
Secondary education	33 (39%)	22 (18%)	
High school	8 (9%)	15 (13%)	
University	21 (25%)	39 (33%)	
Other	2 (2%)	6 (5%)	
Marital status, n (%)			0.741
Single	48 (56%)	63 (53%)	
In a relationship	16 (19%)	29 (24%)	
Married	21 (25%)	26 (22%)	
Widowed	0 (0%)	1 (1%)	
Age category, n (%)			< 0.001
< 18	18 (21%)	3 (3%)	
18–25	32 (38%)	46 (39%)	
26–30	6 (7%)	10 (8%)	
31–35	5 (6%)	11 (9%)	
36–40	8 (9%)	3 (3%)	
41–45	1 (1%)	8 (7%)	
46–50	6 (7%)	15 (13%)	
51–55	6 (7%)	17 (14%)	
> 55	3 (4%)	6 (5%)	
Sex, n (%)			0.087
Female	66 (78%)	79 (66%)	

AGSS, association genevoise des sections de samaritains ; BLS, basic life support.

Totals may not equal 100% due to rounding.

	< 6 months	> 6 months	<i>P</i> value
Male	19 (22%)	40 (34%)	
Number of courses BLS courses followed, n (%)			0.291
1 course	42 (49%)	59 (50%)	
2 courses	15 (18%)	32 (27%)	
3 courses	13 (15%)	11 (9%)	
4 courses or more	15 (18%)	17 (14%)	
Training center			< 0.001
AGSS	43 (51%)	107 (90%)	
Firstmed	35 (41%)	2 (2%)	
Other	7 (8%)	8 (8%)	
AGSS, association genevoise des sections de samaritains ; BLS, basic life support.			
Totals may not equal 100% due to rounding.			

Control beliefs was the only dimension of intention to perform CPR that displayed a significant change at 6 months, with 4 out of 5 questions displaying significant differences (Table 2). While the global result for normative beliefs and attitude were similar, participants who had followed their last BLS course more than 6 months before taking the survey were more prone to diffusion of responsibility (94% vs 78%,  $p = 0.001$ ).

Table 2  
Results.

	< 6 months N= 85	≥ 6 months N= 119	<i>P</i> value
Attitude (mean ± SD)	7.2 ± 1.0	7.3 ± 0.8	0.304
Q1 – Thinking that performing resuscitation could save a life, n (%)	81 (95%)	114 (96%)	1
Q2 – Knowing the importance of starting a resuscitation before EMS arrival	81 (95%)	116 (97%)	0.454
Q3 – Not being afraid of disease transmission	64 (75%)	115 (97%)	0.105
Q4 – Not being afraid of hurting the victim by performing CPR	82 (96%)	3.36%	1
Q5 – Not being afraid of worsening the victim's condition	74 (87%)	112 (94%)	0.087
Q6 – Not being afraid of legal action	78 (92%)	98 (82%)	0.064
Q7 – Being proud of performing resuscitation successfully	68 (80%)	99 (83%)	0.584
Q8 – Belief that knowing CPR is important for the society	83 (98%)	118 (99%)	0.572
Subjective normative beliefs	3.1 ± 0.8	2.8 ± 0.9	0.057
Q1 – Belief that relatives would be proud if the participant performed resuscitation	68 (80%)	99 (83%)	0.584
Q2 – Belief that relatives want the subject to resuscitate them if needed	69 (81%)	90 (76%)	0.394
Q3 – Knowing that relatives are the most likely victim	44 (52%)	55 (46%)	0.479
Q4 – Diffusion of responsibility	80 (94%)	93 (78%)	0.001
Control beliefs	4.6 ± 0.8	3.8 ± 1.3	< 0.001

CPR, cardiopulmonary resuscitation ; EMS, emergency medical services.

Totals may not equal 100% due to rounding.

	< 6 months N = 85	≥ 6 months N = 119	<i>P</i> value
Q1 – Knowledge of the emergency number	83 (98%)	103 (87%)	0.005
Q2 – Feeling able to resuscitate	73 (86%)	72 (61%)	< 0.001
Q3 – Feeling able to recognize a cardiac arrest	80 (94%)	81 (68%)	< 0.001
Q4 – Not believing that only healthcare professionals can adequately perform resuscitation	79 (93%)	109 (92%)	0.797
Q5 – Knowing how to perform a resuscitation	78 (92%)	84 (71%)	< 0.001
CPR, cardiopulmonary resuscitation ; EMS, emergency medical services.			
Totals may not equal 100% due to rounding.			

Participants who had followed a BLS course during the last year were more afraid of disease transmission (74% vs 89%,  $p = 0.012$ ) (Supplementary Table 2). Fear of legal action was higher in participants who had followed their last BLS course more than 2 years ago (24% vs 11%,  $p = 0.040$ ) (Supplementary Table 3).

## Discussion

Control beliefs, including knowledge of the emergency number to dial in case of cardiac arrest, decreased significantly already 6 months after the last BLS course. While some have advocated for a much shorter than the recommended 2-year interval between BLS refresher courses given the need to freshen up CPR skills [19, 20], these results show that the intention to perform resuscitation needs also be restored or, at least, preserved. Still, other authors have previously emphasized that aiming for refresher courses at more frequent intervals was probably unrealistic as even highly motivated lay rescuers would lack either time or money [21, 22] and as too frequent retraining sessions might lead to disinterest [23]. Other means must therefore be sought to allow for frequent yet short refresher interventions [24–26]. Such interventions should target critical elements such as diffusion of responsibility [27] which quickly rises after a BLS course and might lead to delays before initiation of CPR, thereby increasing the no-flow time and worsening the patient's prognosis [12]. Victims of the so-called bystander effect may be more prone to act if they feel confident and qualified. Thus, short interventions showcasing realistic examples of diffusion of responsibility are by themselves fighting against the phenomenon and encouraging action. It has also been shown that diffusion of responsibility also depends of the level of danger the victim faces [28]. There could also be a significant and lasting effect of starting CPR training at an earlier stage than what

is currently done in Switzerland. Many studies have indeed provided evidence that BLS training yields excellent results in schoolchildren [29, 30].

Though Vaillancourt et al. used the same theoretical model in their 2013 survey, we refrained from using the exact same question set. While we thought the theory of planned behaviour model to be perfectly valid, the way questions are phrased influences the answers given by the participants, their understanding of the problematic, and their willingness to complete the survey [31]. Moreover, some questions were added to address specific issues that were not taken into account in the original survey. Subjective normative beliefs were further assessed by asking whether relatives would be proud if one performed resuscitation. Control beliefs questions were further assessed by asking whether the participant thought that only healthcare professionals would be able to correctly perform CPR. Four other questions were asked regarding attitude, including the participant's take on resuscitation impact on society, fear of doing more harm, and fear of catching a disease [12].

Strangely enough, though the survey was conducted before the COVID-19 pandemic, participants who had followed a BLS course in the year preceding the survey were more afraid of disease transmission. As this study was not designed to investigate this unexpected finding, its cause is not easily determined but could be a difference in course contents. A change in the guidelines could hardly be involved, as the study took place in 2019 with the last major guidelines issued in 2015 [32]. Though actions could be taken to mitigate this fear, their timeliness must be assessed with regard to the current coronavirus disease (COVID-19) pandemic [33].

Of particular concern is the fact that more than half of the participants were unaware that probability of performing CPR was higher on a relative than on a stranger. Whether this item belongs to control beliefs as in Vaillancourt's paper or in subjective normal beliefs as in this study can long be debated, but the critical importance of emphasizing and spreading this message is undeniable. Indeed, lay rescuers who performed CPR for OHCA have described subsequent emotional and social difficulties [34], which may be amplified when CPR has to be performed on a close one rather than on a stranger. Helping lay rescuers recognize this fact might help better prepare them and avoid some of the negative psychological consequences [34, 35]. Moreover, knowledge that friends and family might be efficiently helped by provision of BLS manoeuvres might increase lay rescuers motivation in acquiring and maintaining such critical skills [36].

On a more positive note, the attitude and subjective normative beliefs dimensions were globally preserved even 2 years after the last BLS course. The fact that healthcare professionals are not the only people able to correctly perform CPR now seems to be well-recognized [37]. Fear of litigation however seems to increase with time, and specific reminders of local or regional legislation should be undertaken. In Switzerland, the federal law clearly states that one should help in case of emergency, but that no legal consequence can ensue should the rescuer fail [38].

Though this study has some strengths, such as the relatively high number of participants despite the absence of mail reminders and the absence of outcome assessment bias thanks to electronic data

recording, some limitations must be acknowledged. Lack of e-mail reminders might have led to selection bias, as the proportion of highly-motivated might be higher in this setting. Indeed, the high proportion of participants who had followed 2 or more BLS courses is questioning, particularly given the low rate of bystander initiated CPR in the literature and the obligation of following a BLS course in order to obtain a driving license in Switzerland. Nevertheless, this might, if anything, have dampened the effect of the time elapsed since the last BLS course, and led to underestimation rather than overestimation. Another limitation is that, given the aforementioned technical issues, the real participation rate could not be calculated as the number of sent and bouncing e-mails could not be obtained. Finally, the effect of the COVID-19 pandemic on the intention to perform resuscitation is not known as the survey was conducted prior to this crisis.

## Conclusions

Control beliefs, one of the three dimensions of intention to perform resuscitation, decreased significantly already 6 months after the last BLS course. Restoring this dimensions to the immediate post-BLS course state should be sought to enhance CPR provision by lay-rescuers in case of OHCA. Far beyond technical issues, this goes through short interventions aimed at building self-confidence and capacity in order to reinforce the need to act in the case of an emergency.

## Abbreviations

AGSS Association Genevoise des Sections de Samaritains

BLS Basic Life Support

COVID-19 Coronavirus Disease 2019

CPR CardioPulmonary Resuscitation

OHCA Out-Of-Hospital Cardiac Arrest

SMUR Service Mobile d'Urgences et de Réanimation

## Declarations

### Ethics approval and consent to participate

Although such surveys do not fall within the scope of the Swiss federal act on research involving human beings [14], the synopsis of our protocol was submitted to the regional ethics committee (CCER - Commission cantonale d'éthique de la recherché, Geneva, Switzerland). As no health related outcome our data was either recorded or asked for, this committee issued a non-objection statement (ID 2018-01382).

Consent to participate was gathered electronically: upon loading, the website immediately displayed a summarized consent form and a confidentiality notice as well as a link to a detailed description of the study.

## Consent for publication

Not applicable.

## Availability of data and materials

The dataset supporting the conclusions of this article is available in the Mendeley Data repository: doi 10.17632/7cny37gdmm.1; <https://data.mendeley.com/datasets/7cny37gdmm/1> [18].

## Competing interests

The authors declare that they have no competing interests

## Funding

None

## Authors' contributions

SR: Conceptualization, Formal analysis, Writing - Original Draft

DR: Conceptualization, Formal analysis, Writing - Original Draft

MS: Methodology, Software, Writing - Review & Editing

CG: Conceptualization, Writing - Review & Editing

RL: Writing - Review & Editing, Validation

MN: Formal analysis, Writing - Review & Editing

FS: Methodology, Writing - Review & Editing, Resources

LS: Conceptualization, Methodology, Software, Data Curation, Writing - Review & Editing, Supervision, Project administration

## Acknowledgements

The authors would like to thank the Association Genevoise des Sections de Samaritains and Firstmed for having sent recruitment e-mails on their behalf.

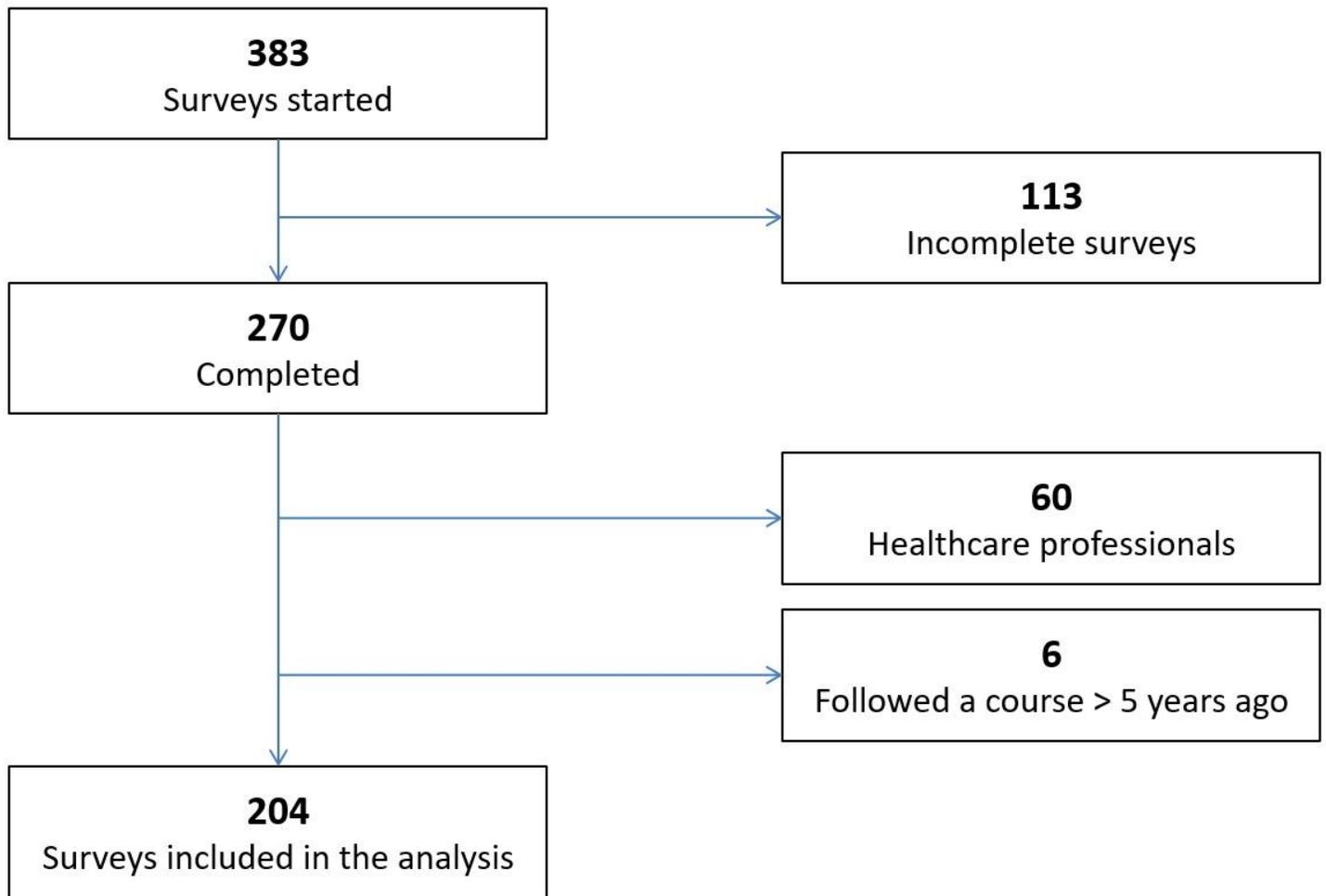
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## Figures



**Figure 1**

Study flowchart.

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