

## RESEARCH ARTICLE

# Nurses' perceptions of medical procedures and nursing practices for older patients with non-cancer long-term illness and do-not-attempt-resuscitation orders: A vignette study

Asaka Higuchi<sup>1,2</sup>  | Azusa Yoshii<sup>3</sup> | Morihito Takita<sup>2,4</sup> | Masaharu Tsubokura<sup>5,6</sup> | Hiroki Fukahori<sup>7</sup> | Rika Igarashi<sup>3</sup>

<sup>1</sup>Department of Home Care Nursing in Nursing Graduate School of Health Care Sciences, Tokyo Medical and Dental University, Tokyo, Japan

<sup>2</sup>Medical Governance Research Institute, Tokyo, Japan

<sup>3</sup>Department of nursing, Minamisoma Municipal General Hospital, Minamisoma, Japan

<sup>4</sup>Department of Internal Medicine, Jyoban Hospital of Tokiwa Foundation, Iwaki, Japan

<sup>5</sup>Department of Public Health, School of Medicine, Fukushima Medical University, Fukushima, Japan

<sup>6</sup>Research Center for Community Health, Minamisoma Municipal General Hospital, Minamisoma, Japan

<sup>7</sup>Faculty of Nursing and Medical Care, Keio University, Kanagawa, Japan

## Correspondence

Asaka Higuchi, Medical Governance Research Institute, Residence Takanawa Room No. 201, 12-13, Takanawa 2 chome, Minatoku, Tokyo, 108-0074, Japan.  
Email: ns170014@tmd.ac.jp; a.higuchi1025@gmail.com

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## 1 | INTRODUCTION

The do-not-attempt-resuscitation (DNAR) order is a major issue of end-of-life decision-making. A DNAR order was defined by the American Medical Association (AMA) as an order to withhold cardiopulmonary

## Abstract

**Aim:** To elucidate influence of a do-not-attempt-resuscitation (DNAR) order on nurses' perceptions of the medical procedures and nursing practices for non-cancer older patients.

**Design:** A vignette-based questionnaire study.

**Methods:** A questionnaire survey asking nurses their perceptions of clinical practices for the following three vignettes was performed in a community hospital in Japan ( $N = 120$ ): the control vignettes with an older patient with repeated heart failure who was living alone and the other two with either an absence of relatives or a diagnosis of dementia. We also prepared additions to each vignette describing a DNAR order.

**Results:** Nurses' perception on cardiopulmonary resuscitation, defibrillation, blood tests and intravenous nutrition showed statistically significant and minimally important declines after the DNAR order compared with before for all three vignettes ( $p < .001$ ). DNAR orders can influence nurses' perceptions of clinical practices for non-cancer older patients with chronic heart failure.

## KEYWORDS

aged, chronic disease, dementia, family relations, nurses, nursing, social conditions

resuscitation in the event of cardiopulmonary arrest (Council on Ethical and Judicial Affairs, American Medical Association, 1991). It ensures the patient's autonomy by withholding cardiopulmonary resuscitation (CPR) if, in the judgement of the attending physician, an attempt to resuscitate the patient would be futile. Any clinical procedures other than CPR should be performed according to the patient's

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condition regardless issuing DNAR orders. Previous studies, however, revealed that clinical practices other than CPR could be withheld once the DNAR order is given (Osinski, Vreugdenhil, de Koning, & van der Hoeven, 2017). Of note, it should be cautious to interpret the previous findings since CPR consists of a series of multiple medical procedures, not a single intervention, including chest compression, defibrillation, administration of vasopressors and/or tracheal intubation when the patients develop cardiopulmonary arrest (Reed-Schrader, Rivers, White, & Clemency, 2018) and it is practically difficult to definitely classify medical interventions by CPR and non-CPR procedures. The main research area for DNAR orders has been intensive care and palliative care for patients with advanced malignant diseases, while few studies for those non-malignant long-term illness such as chronic heart disease have been reported. Medical care for older patients with heart failure is an emerging health issue in Japan where the population is rapidly ageing (Konishi et al., 2016) and nurses have been expected to play a central role to provide multidisciplinary health care for heart failure patients (Morton, Masters, & Cowburn, 2018). Thus, we performed a clinical vignette study, which allows direct comparison for different scenarios of *virtual patients* (Bachmann et al., 2008), to elucidate influence of DNAR orders on the nurses' perception of clinical practices for a patient with chronic heart failure.

## 2 | BACKGROUND

Previous studies have shown that a range of medical procedures and nursing practices may be reduced or withheld for patients issued a DNAR order despite of the AMA's definition of the DNAR order. For example, medical procedures such as the administration of antimicrobial therapy, blood transfusion, pain medication and nutritional management—in addition to CPR—may be influenced by DNAR orders (Evans & Brody, 1985; Hiraoka et al., 2016; Katsetos & Mirarchi, 2011). Additionally, the frequency of physical examination, blood testing and imaging studies appears to decrease among people with cancer after a DNAR order is issued (Keenan & Kish, 2000). A report showed that even hospitalization and chemotherapy were withheld from such patients (Azad, Siow, Tafreshi, Moran, & Franco, 2014).

Research on DNAR orders has primarily been advancing in the intensive care or clinical management for patients with advanced cancer (Trivedi, 2013; Wang, Ma, Kao, Tsai, & Chang, 2018). This is particularly because problems related to DNAR orders, such as consent given by substitutes because of patients' minimally conscious states, are frequently discussed in the field of intensive care or palliative care for people with cancer with advanced stage. Those with advanced malignant diseases are more likely to agree to a DNAR order when they have no radical treatment option. By contrast, patients with non-malignant and long-term diseases such as chronic heart failure are more likely to change their minds about DNAR orders since it is difficult to predict their prognosis.

Older patients with non-cancer chronic diseases also tend to have more complex cases concerning DNAR orders. Physicians are likely to issue DNAR orders to patients with the following

characteristics: dementia, lower activities of daily living or living alone (Ethical Committee of the Japanese Society of Intensive Care Medicine, 2017). Furthermore, a survey of physicians revealed that various medical procedures—such as intravenous fluid, nutrition and pain management—in addition to CPR were withheld from patients showing deteriorated activities of daily living after a DNAR order (Ethics Committee, Japanese Society of Intensive Care Medicine, 2017). These findings suggest that specific patient characteristics influence whether physicians or nurses withhold medical and/or nursing practices other than CPR after a DNAR order. It is therefore necessary to investigate these characteristics for older patients with non-cancer chronic disease, which is the focus of this study.

## 2.1 | Research question

This study was designed to address the following research questions:

- Does a DNAR order influence nurses' perception of routine clinical practices for older patients with chronic heart failure?
- Does a DNAR order influence nurses' perception of routine clinical practices for older patients with chronic heart failure when they have either an absence of any relatives to contact or a diagnosis of dementia?

We hypothesized that nurses' perceptions of medical procedures and nursing practices, in addition to CPR, for older patients with non-cancer chronic disease will be affected by a DNAR order even when they have either an absence of any relatives to contact or a diagnosis of dementia. To test this hypothesis, we developed hypothetical vignettes, which are virtual patient scenarios, of an 85-year-old female patient with intractable heart failure who was living alone and additional two vignettes with either an absent of any relatives to contact or a diagnosis of dementia. These vignettes represented the common characteristics of patients with non-cancer long-term illness and who are hospitalized in a community hospital that we studied. A clinical vignette study has been recognized as a valid tool for elucidating the factors influencing medical decision-making among medical professionals (Bachmann et al., 2008; Bos-Touwen, Trappenburg, van der Wulp, Schuurmans, & de Wit, 2017). We explored how nurses' perceptions of various medical procedures and nursing practices change before and after a DNAR order is issued in this study.

## 3 | THE STUDY

### 3.1 | Study design

We conducted a clinical vignette study with self-administered anonymous questionnaires (Bachmann et al., 2008; Bos-Touwen et al., 2017). The questionnaires were prepared to allow comparing nurses' perception of routine clinical practices along with CPR procedures

for three different *virtual* patients with chronic heart failure before and after DNAR orders issued.

### 3.2 | Study institute

This study was carried out in a largest community hospital in Minamisoma City, Fukushima Prefecture in Japan, where is a medically underserved area with an ageing population. The numbers of physicians and nurses per 100,000 people in Minamisoma City are lower than the national average (154 and 615 in Minamisoma City, respectively, 233 and 855 nationwide) (Minamisoma City, 2015). In 2011, the city was suffered by the triple disaster known as the Great East Japan Earthquake. Thirty-four per cent of the population were aged 65 years and older in December 2016, which is much higher than the national average of 26.6% Ministry of Internal Affairs & Communications of Japan, 2015). The number of deaths per year in the study hospital showed an approximately 28% increase over the past 5 years (from 211 in 2012–270 in 2017). As such, attention is being paid to improving the quality of medical practices among older patients.

### 3.3 | Development of vignettes and questionnaires

We held a group discussion with seven nurses who had five years or more of experience working in the study hospital to develop the vignettes in this study and determine the medical and nursing practices we would assess. The vignettes were developed to reflect representative patients with non-cancer chronic disease who had been hospitalized and to include various patient characteristics shown to influence nursing care therein (Barker, Lynch, & Hopkinson, 2017; Ethical Committee, Japanese Society of Intensive Care Medicine, 2017; Poole et al., 2018; Rolls, Seymour, Froggatt, & Hanratty, 2011).

The following three vignettes were included in the survey: *vignette A*, the control vignette, described a patient of an 85-year-old woman living alone who has been repeatedly hospitalized due to exacerbation of heart failure and developed aspiration pneumonia. *Vignette B* contained the same scenario as vignette A, with the addition that the patient had no relatives to contact. *Vignette C* also included the same patient information as vignette A but also incorporated a diagnosis of dementia. We also prepared another pair of each vignette which describing issue of DNAR orders. In total, six vignettes, consisting of vignette A, vignette B and vignette C without DNAR orders issued and the corresponding vignettes with addition of DNAR order (Appendix S1).

A total of 29 medical and nursing practices were listed after the group discussion of nurses to best represent common clinical practices of older patients with non-cancer chronic disease (Appendix S2). Ten procedures out of the 29 listed practices were extracted for the survey based on previous studies, consisting of common medical practices (Q1–Q6) and nursing care (Q7–Q10) (Appendix S3). A 5-point Likert scale (never do = 1, unlikely = 2, neutral = 3, likely = 4

or always do = 5) was used to quantify participants' perception concerning individual medical and nursing practices when the vignettes were given (Appendix S3). Of note, CPR was defined medical interventions including chest compression and airway management with tracheal intubation or laryngeal mask following cardiopulmonary arrest in the questionnaire.

### 3.4 | Participants of questionnaire survey

We distributed the survey to all nurses ( $N = 160$ ) in the community hospital where we developed the vignettes for this study and asked them to voluntarily answer it. The survey was conducted for two weeks between December 2017–January 2018. The licence of nurse in Japan is classified by Registered Nurse as a national qualification and licensed practical nurse as a regional qualification. Licensed practical nurses provide nursing services under the direction of physicians or Registered Nurse (Turale, Ito, & Nakao, 2008).

### 3.5 | Statistical analysis

Participants' characteristics were first summarized with descriptive statistics. We compared the scores for the various medical and nursing practices for each vignette before and after the DNAR order using non-parametric Wilcoxon rank sum test. We also analysed how respondents' characteristics influenced the changes in scores before and after DNAR order for each vignette using the generalized linear model. We included years of working with specialized licences and education on DNAR after assessing the multicollinearity of the participants' characteristics. We considered the minimally important difference of the scores as a change of  $\geq 1$  in the median score (De Vet, Terwee, Mokkink, & Knol, 2011). Statistical significance was considered as a p-value of less than 0.05. Statistical analyses were performed with SPSS Statistics 25 (IBM corp., Armonk, NY).

### 3.6 | Ethical considerations

The study was approved by the institutional review boards of the hospital that we surveyed (approval number: 29-13) and Tokyo Medical and Dental University (approval number: M2017-339).

## 4 | RESULTS

### 4.1 | Participant characteristics

We obtained responses from a total of 120 nurses: 117 Registered Nurses and three licensed practical nurses (81% of response rate). All participant characteristics are shown in Table 1. Eleven per cent of nurses ( $N = 13$ ) had a bachelor's degree or higher. Eighty-four per cent ( $N = 96$ ) answered that they knew the definition of DNAR order

and 97% ( $N = 115$ ) had been involved in the care of patients with DNAR orders issued. All eight nurses who indicated that they had received education on DNAR in their undergraduate education were Registered Nurses and aged between 20–29.

## 4.2 | Change in nurse's perception of clinical practices before and after DNAR order

Scores of the medical and nursing practices for each vignette at baseline and post-DNAR order are shown in Table 2. In vignette A as a control, all scores showed a statistically significant decline after the DNAR order compared with before DNAR ( $p \leq .001$ ), except for communication with the patient and family. Minimally important declines were found in CPR, defibrillation, blood tests, intravenous nutrition and palliative nursing care, while the oxygen administration, pain management, communication, report of vital signs and consultation with colleagues did not show notable differences.

In vignette B, which included a scenario of the absence of any relatives to contact, “nursing practices of positioning, cooling and hot fomentation,” “increasing communication with patients and their families” and “consultation with colleagues” did not show statistically significant differences before and after the DNAR order, whereas all the other procedures showed a statistically significant declines ( $p \leq .001$ ). The median scores of CPR and defibrillation showed minimally important declines from 3 (neutral)–2 (unlikely) after the

DNAR order, while those of clinical laboratory test and intravenous nutrition declined from 4 (likely)–3 (neutral).

In vignette C, which incorporated a diagnosis of dementia, we observed statistically significant differences ( $p < .01$ ) for all procedures except for communication, which had a marginally statistically significant difference ( $p = .050$ ). The median scores of CPR, defibrillation, blood tests and intravenous nutrition showed minimally important declines.

## 4.3 | Participant characteristics associated with changes in nurses' perception of clinical practices

The generalized linear models revealed a statistically significant association between participants' characteristics and changes in medical decision-making before and after a DNAR order (Table 3). We selected only CPR, defibrillation, blood tests and intravenous nutrition in all three vignettes, as well as nursing practices such as positioning, cooling and hot fomentation in vignette A, for this analysis because they showed minimally important differences. We found that years of working experience was significantly and negatively related to CPR and defibrillation scores in vignette B. Furthermore, we also found a relation between years of working experience and CPR score in vignette C ( $p < .05$ ).

## 5 | DISCUSSION

This study showed that nurses' perceptions of medical procedures and nursing practices may be influenced by the presence or absence of a DNAR order among older patients with non-cancer chronic disease of repeated heart failure. Furthermore, nurses' perception of clinical practices on DNAR orders was significantly influenced by years of working experience for vignettes B and C which had patient characteristics of a lack of relatives and dementia, respectively.

As patients' values have diversified, the importance of DNAR orders has become increasingly recognized among medical professionals to ensure patient autonomy especially in developed countries (Mello & Jenkinson, 1998). However, there is little understanding of how DNAR orders influence medical decision-making for older patients with non-cancer chronic disease, or how patients' characteristics interact with this influence. The findings of our study therefore add an evidence of deterioration of nurses' perception for common clinical practices after DNAR orders issued.

Most of medical procedures and nursing practices across the three different vignettes were influenced by DNAR orders although the effects of changes in the scores were small. The scores of CPR showed a statistically significant decline after a DNAR order in all three vignettes; this was expected, given that the definition of DNAR orders on CPR (Council on Ethical and Judicial Affairs, 1991). We also observed minimally important declines in blood tests, management of intravenous nutrition and defibrillation across the vignettes, which is consistent with the results of

**TABLE 1** Characteristics of participants ( $N = 120$ )

Variables	Value
Age, $N$ (%)	
20–29	35 (29)
30–39	27 (23)
40–49	41 (34)
$\geq 50$	17 (14)
Gender, $N$ (%)	
Female	111 (93)
Education, $N$ (%)	
Nursing school	107 (89)
Bachelor's or higher degree (3–4 years)	13 (11)
Years of experience working in the hospital, mean ( $SD$ )	14.8 (10.3)
Years of serving in the current hospital, mean ( $SD$ )	9.2 (8.8)
Experience of caring for DNAR patients, $N$ (%)	
Never	4 (3)
At least once	115 (97)
Knowledge of DNAR, $N$ (%)	
Yes (“I know the definition of a DNAR order”)	96 (84)
Opportunity for education on DNAR order (multiple answers possible), $N$ (%)	
Undergraduate education	8 (7)
Continuous medical education after graduation	13 (11)

**TABLE 2** Scores of nurses' perception of clinical practices before or after DNAR order

Vignette	Medical procedures	Before DNAR	After DNAR	p
A	Q1 Cardiopulmonary resuscitation	4 (3, 5)	2 (1, 2)	<.001
	Q2 Defibrillation	3 (3, 4)	2 (1, 2)	<.001
	Q3 Blood test	4 (4, 5)	3 (3, 4)	<.001
	Q4 Intravenous nutrition	4 (4, 5)	3 (3, 4)	<.001
	Q5 Oxygen administration	4 (4, 5)	4 (3, 4)	<.001
	Q6 Palliative care with medications	4 (4, 5)	4 (3, 4)	<.001
	Q7 Nursing practices such as positioning, cooling and hot fomentation	5 (4, 5)	4 (4, 5)	<.001
	Q8 Increasing communication with patients and their families	4 (4, 5)	4 (4, 5)	.499
	Q9 Reporting vital signs	4 (4, 5)	4 (4, 5)	<.001
	Q10 Consultation with colleagues	4 (4, 5)	4 (4, 5)	.001
B	Q1 Cardiopulmonary resuscitation	3 (2, 4)	2 (1, 2)	<.001
	Q2 Defibrillation	3 (2, 4)	2 (1, 2)	<.001
	Q3 Blood test	4 (3, 4)	3 (2, 4)	<.001
	Q4 Intravenous nutrition	4 (3, 4)	3 (3, 4)	<.001
	Q5 Oxygen administration	4 (4, 5)	4 (3, 4)	<.001
	Q6 Palliative care with medications	4 (3, 4)	4 (3, 4)	<.001
	Q7 Nursing practices such as positioning, cooling and hot fomentation	4 (4, 5)	4 (4, 5)	.069
	Q8 Increasing communication with patients and their families	4 (3, 5)	4 (3, 5)	.097
	Q9 Reporting vital signs	4 (4, 5)	4 (4, 4)	.001
	Q10 Consultation with colleagues	4 (4, 5)	4 (4, 5)	.290
C	Q1 Cardiopulmonary resuscitation	4 (3, 4)	2 (1, 2)	<.001
	Q2 Defibrillation	4 (3, 4)	2 (1, 2)	<.001
	Q3 Blood test	4 (3, 4)	3 (2, 4)	<.001
	Q4 Intravenous nutrition	4 (4, 4)	3 (3, 4)	<.001
	Q5 Oxygen administration	4 (4, 5)	4 (3, 4)	<.001
	Q6 Palliative care with medications	4 (4, 4)	4 (3, 4)	<.001
	Q7 Nursing practices such as positioning, cooling and hot fomentation	4 (4, 5)	4 (4, 5)	<.001
	Q8 Increasing communication with patients and their families	4 (4, 5)	4 (4, 5)	.050
	Q9 Reporting vital signs	4 (4, 5)	4 (4, 4)	<.001
	Q10 Consultation with colleagues	4 (4, 5)	4 (4, 5)	.009

Note: Values represent median and interquartile range. Higher scores indicate a higher likelihood of performing individual medical procedures. A full description of clinical practices surveyed is provided in Appendix S3. Statistical analyses were performed using non-parametric Wilcoxon rank sum test.

previous studies in intensive care patients and people with cancer (Evans & Brody, 1985; Hiraoka et al., 2016; Katsetos & Mirarchi, 2011).

The changes in scores for CPR, defibrillation, blood tests and intravenous nutrition before and after the DNAR order all suggest a tendency towards withholding the procedures. However, the changes differed between vignettes. For example, the CPR score in vignette B before DNAR order was "neutral," whereas it was "likely" in vignettes A and C. Vignette B incorporating an episode of a lack of relatives, suggesting that not having any relatives, in addition to living alone, might cause nurses to avoid providing intensive critical care. This result is consistent with the results of previous studies of intensive care patients, showing that patient social characteristics might affect clinical practice after DNAR issued (Brennan, 1988).

In all vignettes, the scores for blood tests and intravenous nutrition before the DNAR order were at the "likely" level and decreased after the DNAR order to "neutral." In this context, "neutral" suggests that nurses may withhold blood tests and intravenous nutrition after a DNAR order, regardless of the characteristics of the vignettes. Similar results were found in a previous survey conducted by the Japanese Society of Intensive care medicine—that is 34.6%, 24.5% and 8.4% of physicians responded that they would withhold blood cultures, blood gas collection and intravenous nutrition, respectively, after a DNAR order (Ethics Committee, 2017).

The score of "nursing practices such as positioning, cooling and hot fomentation" in vignette A was at the level of "always" before the DNAR and declined to "likely" afterwards. This finding contradicts the results of a survey conducted by nurses working in the intensive

**TABLE 3** Factors predicting change in perceptions of clinical practices before and after DNAR order

Vignette	Procedures	Factor	Beta for parameter estimates	p-value for model effect
A	Cardiopulmonary resuscitation	Years of work experience	-0.04	.09
		Education on DNAR	0.3	.3
	Defibrillation	Years of work experience	-0.01	.5
		Education on DNAR	0.09	.8
	Blood test	Years of work experience	-0.01	.2
		Education on DNAR	-0.8	.07
	Intravenous nutrition	Years of work experience	-0.004	.2
		Education on DNAR	-0.9	.056
Nursing practice	Years of work experience	0.02	.1	
	Education on DNAR	-0.135	.7	
B	Cardiopulmonary resuscitation	Years of work experience	-0.03	.03
		Education on DNAR	0.2	.6
	Defibrillation	Years of work experience	-0.03	.04
		Education on DNAR	0.2	.7
	Blood test	Years of work experience	-0.01	.6
		Education on DNAR	-0.5	.2
	Intravenous nutrition	Years of work experience	-0.01	.7
		Education on DNAR	-0.1	.7
C	Cardiopulmonary resuscitation	Years of work experience	-0.02	.03
		Education on DNAR	0.4	.3
	Defibrillation	Years of work experience	-0.01	.1
		Education on DNAR	0.5	.2
	Blood test	Years of work experience	-0.01	.4
		Education on DNAR	-0.3	.5
	Intravenous nutrition	Years of work experience	-0.01	.6
		Education on DNAR	-0.4	.4

care unit, which showed that such nursing practices increased after a DNAR order (Henneman, Baird, Bellamy, Faber, & Oye, 1994).

The generalized liner model was employed to examine the characteristics of nurses associated with shifts in perception about medical and nursing practices after a DNAR order is given. We observed negative and statistically significant associations between years of working experience and changes in CPR in vignettes B and C (Table 3). This suggests that as the years of working experience increased, the likelihood of being affected by a DNAR order decreased. This is perhaps because more experienced nurses can better anticipate the purpose of a DNAR order according to the patient's situation before the DNAR order. However, it is unknown whether these predictions are appropriate or not. Further research is necessary.

Notably, history of past education on DNAR did not influence the results. This might be due to the contents of the DNAR education they have received, rather than history of past opportunities for DNAR education per se. Most of nurses participated in this study experienced DNAR orders in real nursing care, but only eight have learned about it during basic education before employment. Thus, most of nurses (85%) participated in this study learned DNAR

orders through self-study and/or clinical practice. All eight nurses who learned DNAR orders before employment were the Registered Nurses and aged under 30 years, suggesting that the education of DNAR orders in the undergraduate course was recently initiated. The standard curriculum for nursing education was released by the Ministry of Education, Culture, Sports, Science and Technology of Japan in 2017, which does mention importance of ensuring patient autonomy in the care of older patients, but not the term of DNAR order (Ministry of Education, Culture, Sports, Science and Technology of Japan, 2017). It would be of importance to educate about the concept and issues of DNAR order in undergraduate nursing school.

In the results above, it is notable that medical procedures and nursing practices other than CPR were also influenced by a DNAR order, which deviates from the definition of DNAR (Council on Ethical and Judicial Affairs, American Medical Association, 1991). This suggests that in clinical settings with older patients with non-cancer chronic disease, DNAR orders are not well standardized, or that there are notable differences in perceptions among nurses even if the orders are standardized.

## 5.1 | Limitations

There are several limitations on the study presented here. First, this was a single-centre study, which might have led to unintended bias in our results, for example difference in the common patient characteristics and continuing medical education for professionals. The study hospital is in a medically underserved rural area of Fukushima Prefecture with an ageing population; thus, different findings may be observed in other areas, such as urban areas with a more abundant supply of healthcare services. Furthermore, the vignette episodes were selected to reflect representative cases of the study site, which may not be the same in the other hospitals or countries. Second, given that participants' years of working experience influenced the results, we need to capture participant characteristics in more detail, including whether they had a certified nurse qualification, palliative care nursing experience and experience of caring for patients with a DNAR order. Third, we did not determine whether the participants knew that the DNAR order is limited to withholding CPR; thus, it is unknown who actually understood the definition of "DNAR order." Fourth, physicians' perceptions of clinical practice were not evaluated in this study. Further study is necessary to clarify physicians' perceptions and compare those between nurses and physicians. Fifth, the finding in this study may not represent real issues since the vignettes described virtual cases. In the future, we should conduct qualitative studies to assess nursing practice using real cases. Finally, there was a limitation in the questionnaire form: that is, participants' opinions might not be reflected precisely in the results since we simply implemented a 5-point Likert scale. Addition of psychometric assessment with a standardized instrument would help to elucidate nurses' perceptions with an objective way of evaluation. Overall, future studies should be conducted in multiple institutes with a revised questionnaire to obtain detailed participant characteristics. Such study would provide more evidence and generalizability regarding the influence of DNAR orders on clinical practice.

## 6 | CONCLUSION

This study demonstrated that CPR and defibrillation along with other medical procedures—blood tests and intravenous nutrition—can be influenced by DNAR orders for older patients with non-cancer chronic disease which is against the inherent definition of DNAR orders. Our survey was conducted in a community hospital in an area of Japan where the population has been ageing more rapidly than the national average; accordingly, our results might suggest the challenges presented by ageing expected across Japan in the future.

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### CONFLICT OF INTERESTS

The authors declare no conflict of interest in this study.

### AUTHOR CONTRIBUTIONS

AH, AY and M. Tsubokura: Design of the study. AH, AY, M. Tsubokura and RI: Data collection. AH and M. Takita: Data analysis. AH, M. Takita and HF: Drafting of the manuscript. All authors reviewed the final manuscript.

### ETHICAL APPROVAL

Ethical approval for the study was provided by the research ethics committee of the institutional review boards of the hospital that we surveyed (approval number: 29-13) and the Tokyo Medical and Dental University (approval number: M2017-339).

### ORCID

Asaka Higuchi  <https://orcid.org/0000-0002-5106-2610>

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## SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section.

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