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LETTER TO THE EDITOR

Trends in DNAR orders for deteriorating patients in Japan

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To the Editor:

The rapid response system (RRS) has been established to manage and prevent further deterioration resulting in in-hospital cardiac arrest of unstable patients. RRSs also play a role in facilitating end-of-life (EOL) care discussions, such as placement of do-not-attempt-resuscitation (DNAR) orders, among patients and their families [1]. In Japan's aging society, perceptions of EOL care and DNAR orders have changed dramatically. Therefore, the demand for discussions about DNAR orders is expected to gradually increase in RRS settings. However, no studies have clarified the trends of changes in DNAR order decisions for deteriorating patients in Japan. Thus, our study aimed to assess temporal trends in the prevalence of DNAR orders in clinically deteriorating patients requiring RRS activation for 7 years.

We performed a secondary analysis of data from our previous study [2], a retrospective multicenter observational study that explored independent predictors associated with newly implemented DNAR orders post-RRS activation. The Institutional Review Board of Nagoya City University Graduate School of Medical Sciences approved this study (approval number: 60210077; August 24, 2021) and waived the requirement for informed consent due to its observational nature. In this secondary analysis, the database, trends in participating facilities, activation criteria for RRSs, eligibility criteria, and DNAR definitions are described in detail in Online Resource 1. Patients with pre-existing DNAR orders before RRS activation were referred to as "pre-existing DNAR orders," and those with newly implemented DNAR orders post-RRS activation were termed "newly implemented DNAR orders" in our study [2]. Each participating facility had adopted similar activation criteria for the RRS based mainly on vital sign changes. However, the criteria were not consistent across facilities. We evaluated the percentage of patients with pre-existing and newly implemented DNAR orders (7-year trends) on RRS activation each year from 2014 to 2020.

The study cohort comprised 7385 patients. Figure 1 shows trends in the prevalence of pre-existing and newly implemented DNAR orders during 2014–2020 per calendar year. The prevalence of patients with pre-existing DNAR orders (the denominator is total number of patients who required RRS activation, and the numerator is the number of patients with pre-existing DNAR orders before RRS activation) increased from 8.0 to 12.4% between 2014 and 2020. Conversely, the prevalence of pre-existing DNAR orders temporarily decreased by 7.8% around 2017. The prevalence of newly implemented DNAR orders (the denominator is the number of patients with no pre-existing DNAR orders before RRS activation, and the numerator is the number of patients with newly implemented DNAR orders following RRS activation) were unchanged at approximately 5% (range 4.4–6.6%) over the past 7 years.

To the best of our knowledge, no study has explored the annual trends in DNAR orders on RRS activation, to date. Similar research has been conducted on temporary trends in the statewide proportion of pre-existing DNAR orders in US emergency departments. This study reported that the DNAR order proportions in patients aged > 65 years steadily increased from 12.2% in 2002 to 14.3% in 2010 [3]. The common increasing trend in the proportion of placement of DNAR orders in Japanese and previous US studies suggests that EOL care discussions are becoming more frequent. The presented study also found that the prevalence of patients with newly implemented DNAR orders remained unchanged

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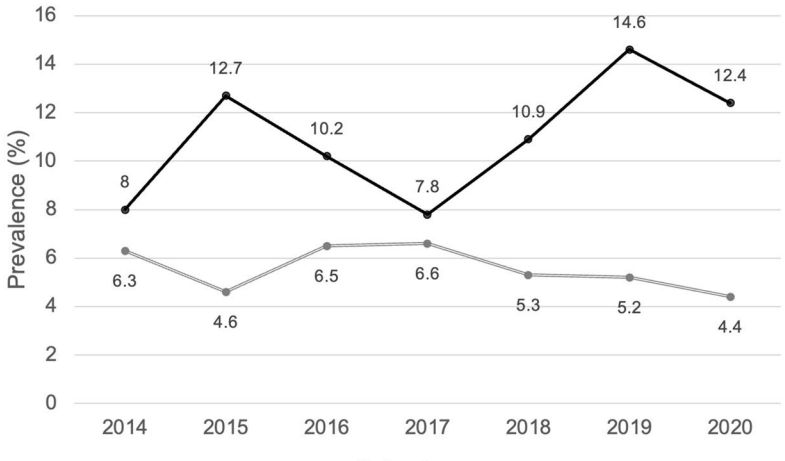

Pre-existing DNAR orders (%)								Total (n)
Pre DNAR	58	143	130	96	120	161	102	810
RRS calls	729	1121	1276	1233	1099	1103	824	7385
Newly implemented DNAR orders (%)								
New DNAR	42	45	74	75	52	49	32	369
Non DNAR	671	978	1146	1137	979	942	722	6575

Fig. 1 Trends in the prevalence of patients with pre-existing and newly implemented DNAR orders around RRS activation during 2014–2020 per calendar year. The prevalence of patients with pre-existing DNAR orders (the denominator is total number of patients who required RRS activation [RRS calls], and the numerator is the number of patients with pre-existing DNAR orders before RRS activation [Pre DNAR]) increased from 8.0 to 12.4% between 2014 and 2020, and temporarily decreased by 7.8% around 2017. The prevalence of newly implemented DNAR orders (the denominator is the number of patients with no pre-existing DNAR orders before RRS activation [Non DNAR], and the numerator is the number of patients with newly implemented DNAR orders following RRS activation [New DNAR]) were unchanged at approximately 5% (range 4.4–6.6%). *RRS* rapid response system, *DNAR* do-not-attempt-resuscitation

for 7 years. However, the reason for this difference in the trends in the prevalence between patients with pre-existing DNAR orders and those with newly implemented DNAR orders remains unclear.

The prevalence of pre-existing DNAR orders temporarily decreased around 2017 in our study. In the same year, the Ethical Committee members of the Japanese Society for Intensive Care Medicine issued a statement [4] regarding DNAR orders for healthcare providers because misunderstanding these orders could lead to misguided EOL care with disregard for human rights. Although the statements regarding EOL care and DNAR orders may have influenced changes in DNAR orders, determining the definite association between the statements regarding EOL care or DNAR orders and decreasing changes in the DNAR orders based on this result remains challenging.

Trends in the activation rates, changes in the criteria for RRS calls, and the exact time when DNAR was ordered were not available in the database, which are limitations of this study. This missing information could have influenced the results. Further studies with databases containing detailed information on the activity or criteria for RRS calls from each facility are needed to better understand the factors that could influence DNAR order-related decisions. Moreover, research on DNAR order trends not only in clinically deteriorating patients who required RRS calls but also in those with in-hospital cardiac arrest who were treated by resuscitation teams is warranted.

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Declarations

Consent for publication This paper has been reviewed by all the co-authors, and permission for publication has been granted.

Availability of data and materials The data in this manuscript were provided by the In-Hospital Emergency Committee in Japan under license. The datasets used and analyzed during this study are available from the corresponding author upon reasonable request with the permission of the In-Hospital Emergency Committee in Japan.

Conflict of interest Tatsuya Tsuji, Yoshiki Sento and Kazuya Sobue declare that they have no competing interests.

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