Chapter 5

Satisfaction of nurses and physicians with the introduction of a Rapid Response System in Dutch Hospitals

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Submitted

Abstract

Objective: To measure the degree of satisfaction of nurses and physicians with the implementation of a Rapid Response Team.

Design: This study is a secondary analysis of the COMET-trial, a pragmatic prospective Dutch multicenter before-after study.

Setting: Questionnaires were distributed among physicians and nurses of the medical and surgical wards participating in the COMET-study at 7 and 14 months after introduction of a Rapid Response Team (RRT). The questionnaires included 24 questions with respect to how respondents used the MEWS/SBAR tools and RRT, their level of satisfaction with MEWS/SBAR and RRT and the characteristics of the respondents.

Measurements and Main Results: The response rate was 1005/1920 (52%). Satisfaction with implementation of the RRS was generally higher at t=14 compared to t=7 months and in respondents working on surgical versus medical wards. In a multivariate analysis, independent predictors of high satisfaction were timing of the questionnaire (14 months versus 7 months after start of an RRT), the support of the RRT system by local ward management, and having an RRT that was considered to be open and approachable.

Conclusions: Our findings show that healthcare workers generally are very satisfied with RRTs in their hospital and that satisfaction increases over time. In addition to direct beneficial effects on relevant patient outcomes, this in itself is an argument in favour of implementing RRTs in hospitals.

Introduction

Rapid Response Systems (RRSs) have been introduced in hospitals to improve recognition of and response to deteriorating hospital ward patients. [1] An RRS can be seen as an intensive care-based, organization-wide preventive approach to the management of deteriorating patients, and implementing the RRS requires more than just standardization of 'calling criteria' and the rapid response of a dedicated acute care team. The RRS consists of three important components. The afferent limb is designed to identify the deteriorating patient by using calling criteria such as the Modified Early Warning Score (MEWS) card and to trigger a response. The efferent limb involves directed action of the Rapid Response Team (RRT) and the third component includes measures to improve the quality of care on the ward, training and feedback. [1,2]

An optimal RRS should ensure 1) the support of all physicians and nurses, 2) leadership and support from senior hospital executives, 3) 24/7 response by staff with appropriate skills, knowledge and experience, and 4) the promotion of hospital-wide awareness of the system. [3]

The effectiveness of RRSs has not yet been proven conclusively. So far, the effectiveness of the introduction of RRSs in hospitals was shown only in two studies. The study by Priestly [4] showed a reduction in hospital mortality, while the study of Ludikhuize et al [5] showed a reduction of the composite endpoint including cardiac arrest, death and unplanned ICU admission. Another multicenter randomized study executed by Hillman [6] in Australia could not demonstrate a benefit from the introduction of a Medical Emergency Team based RRS.

Besides effects on relevant patient outcomes, the value of an RRS also depends on how satisfied nurses and physicians are with the system. Satisfaction of healthcare workers with the RRSs not only a subjective measure of contentment with the support the RRS offers to the care for their patients, it also is a prerequisite for proper implementation and performance of the RRS. Nurses will only call a Rapid Response Team if they expect to be supported by it. Fear of being criticized by members of an RRT for their care for deteriorating patients was reported to be a barrier for implementing an RRS. [7-9] In the Netherlands, we recently implemented an RRS in 12 hospitals.

Aim of this study was to measure the degree of satisfaction of nurses and physicians with the implementation of an RRS and the perceived benefit of the system.

Methods

Design, setting, participants

This study is part of the Cost and Outcome Medical Emergency Team (COMET) study which was executed in the Netherlands from 2009 until 2011. The COMET study was a pragmatic prospective before-after multicenter study in which 12 Dutch hospitals participated. The before period lasted five months in which baseline characteristics were collected. Subsequently, the RRS was introduced in a 2-steps fashion. First, in the MEWS/SBAR phase, which lasted seven months, the Modified Early Warning Score (MEWS) card and the Situation-Background-Assessment-Recommendation (SBAR) communication tool were introduced to identify patients at risk and to facilitate communication between nurses and physicians. Secondly, the RRT was implemented and this phase lasted 17 months; it was divided into two periods namely RRT implementation and the Final RRT phase. In every hospital, patients of 18 years and older who were admitted on two surgical and two medical wards, the so called COMET wards, were included. A full description of the study design (Figure 1) was previously published. [5,10]

During the second phase of the COMET study, questionnaires were distributed to nurses and physicians in all 12 participating hospitals to measure the satisfaction with the RRS on two different time points: 7 and 14 months after introduction of the RRT. On each occasion, participating hospitals distributed 80 questionnaires on the four COMET wards to nurses and physicians. The questionnaires were completed anonymously.

Intervention

The questionnaires included 24 questions covering three aspects; 1) questions on how respondents used the MEWS/SBAR tools and RRT, 2) level of satisfaction with MEWS/SBAR and RRT, 3) characteristics of the respondents (physician/nurse, working on medical/surgical ward, gender, age, experience since graduation (years), employment in the hospital and current ward (years)). Responses to the questions were scored on a scale from 0 – 10 (0 = totally disagree or never, 10 = totally agree or always). A full description of the questionnaires can be found in the Appendix A.

Ethical consideration

The medical ethics committee of the Academic Medical Center in Amsterdam waived the need for formal evaluation of the study due to the observational nature of the study. Consequently, the need for informed consent was not applicable.

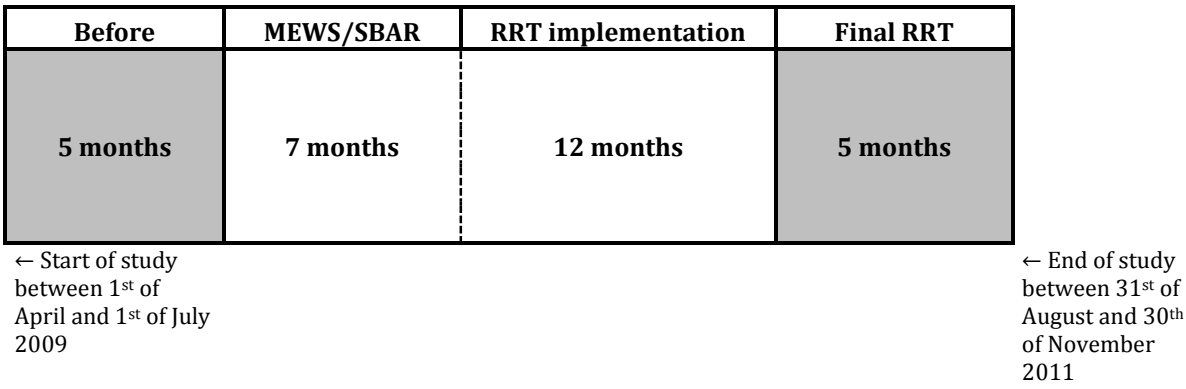

Figure 1. Design of the COMET study.
Following the baseline period of 5 months, the Modified Early Warning Score (MEWS)/Situation-Background-Assessment-Recommendation (SBAR) was implemented for 7 months and subsequently followed up by 17 months in which the rapid response team (RRT) was available. Effects of the RRT on outcomes were measured during the last 5 months and compared with the 5-month baseline period. During the entire length of the study, data were collected on all the endpoints. For further clarification, hospitals were able to start with the study in a 3-month time period. The total study took 30 months, in which each hospital participated for 27 months.

Statistical analysis

Descriptive analyses are presented as raw numbers and percentages. Continuous data were presented as medians with inter quartile range (IQR) due to non-normally distributed data. A bootstrap independent *t-test* was used for comparison of the time points, drawing 1000 samples of the same size as the original samples and with replacement, stratified by the timing of questionnaire. Generalized estimating equation (GEE) was applied to estimate the univariable association between predictors as measured by the questionnaire and satisfaction. Predictors that were used in GEE were 1) timing of questionnaire (7 and 14 months), 2) gender of respondent, 3) surgical/medical ward, 4) number of patients with MEWS ≥ 3 assessed by nurse or physician in the last 2 weeks, 5) age (years) of respondent, and 6) work experience (years) of respondent.

In the GEE, a binomial distribution was assumed after recoding the questions scored on a scale from 0 to 10 into a dichotomous one. Score from 0 to 5 meant never or totally disagree and score from 6 to 10 meant always or totally agree. We indicated the reference category as the one which contained the most answers. Furthermore, a GEE was applied to estimate the multivariable association between demographic and process related items and overall satisfaction with Rapid Response Team. Associations were reported as relative risks (RR). Associations with p-values > 0.1 were manually removed (backward stepwise) from the GEE. The level of significance was set at $p < 0.05$. Statistical analysis was done by using SPSS version 20.0 (Armonk, New York, USA).

Results

Demographic

The response rate was 51% at seven months and 53% at 14 months after RRT implementation. Eighty-five percent of returned questionnaires were filled in by nurses. Further details on the respondents are given in Table 1.

Table 1. Demographics

	RRT implementation phase	
Questionnaire	**7 months**	**14 months**
Respondent, n (% of total)	492 (51)	513 (53)
Gender, male, n (%)	55 (11)	73 (14)
Age, mean ± SD	32.8 ± 10.5	32.6 ± 10.5
Reporter, n (%)		
Physicians	52 (11)	56 (11)
Nurses	421 (85)	438 (85)
Other or unknown	19 (4)	19 (4)
Ward		
Non-surgical ward	231 (47)	248 (48)
Surgical ward	251 (51)	246 (48)
Not reported	10 (2)	19 (4)
Experience since graduation (years), mean ± SD	8.6 ± 9.2	8.15 ± 8.9
Employment in the hospital (months), mean ± SD	96.9 ± 105.2	81.57 ± 90.9
Employment on current ward (months), mean ± SD	65.9 ± 74.7	57.04 ± 66.3

Responses to the questionnaires at seven months and 14 months are given in Table 2. According to their own answers, respondents were more likely to call the RRT if patients had a MEWS > 3 point, and the Rapid Response System was more fully incorporated on the wards at 14 months compared to 7 months after its introduction.

Also, at 14 months compared to seven, support by the management on the ward was higher and it was more often considered “no problem” to explain the RRS to colleagues. Satisfaction with the RRS was generally higher at 14 months. Concerning the perceived attitudes of members of the RRT, respondents tended to be more positive at 14 months than at 7 months.

Table 2. Characteristics of questionnaires, answers given by professionals

Questionnaire	7 Months	14 Months	*p-value*
Use of MEWS/SBAR			
If my patient had a MEWS ≥ 3, I always call the physician of the ward immediately	6.44 (6.19-6.66)	6.87 (6.65-7.06)	0.006
I always use the SBAR communication tool in the communication between the nurse and physician	5.29 (5.05-5.54)	5.49 (5.23-5.73)	0.245
The RRS is fully incorporated in the daily care we provide to our patients on the ward	5.49 (5.28-5.68)	6.26 (6.06-6.46)	0.001
The management of the ward on my nursing ward supports the RRS concept	7.55 (7.36-7.74)	7.87 (7.71-8.03)	0.006
Explaining the MEWS/SBAR and RRT procedure to a new colleague is not a problem	6.52 (6.31-6.74)	6.91 (6.75-7.09)	0.006
Satisfaction using MEWS/SBAR and RRT procedure			
What is your general opinion about the MEWS tool?	7.17 (7.05-7.31)	7.55 (7.42-7.67)	0.001
What is your general opinion about the use of SBAR communication tool?	6.99 (6.85-7.16)	7.08 (6.93-7.21)	0.462
What is your general opinion about the RRT?	7.33 (7.18-7.47)	7.69 (7.56-7.81)	0.001
The use of the MEWS/SBAR tool and RRT procedure creates an unbalanced increase in workload	3.71 (3.46-3.93)	3.32 (3.11-3.54)	0.016
Using the MEWS/SBAR tool, deteriorated patients were identified earlier	6.74 (6.56-6.91)	7.16 (6.99-7.31)	0.002
The RRT is of an added value over using the MEWS/SBAR tool in early recognition and treatment of deteriorated patients	6.73 (6.55-6.91)	7.02 (6.87-7.17)	0.015
The presence of the RRT procedure in our hospital makes sure that physicians review deteriorated patients earlier than before	6.68 (6.49-6.88)	6.79 (6.63-6.95)	0.352
The RRS is very relevant for my daily activities and I will keep using this in the future	7.01 (6.82-7.18)	7.44 (7.28-7.58)	0.001
The RRS is an essential part of the daily care and should be employed in all hospitals	7.28 (7.12-7.43)	7.72 (7.58-7.84)	0.001
Rapid Response Team			
The members of the RRT are kind and helpful during consultation	7.19 (7.03-7.35)	7.54 (7.41-7.76)	0.001
The members of the RRT have a low threshold to contact and are approachable	7.22 (7.04-7.38)	7.48 (7.37-7.60)	0.017
The members of the RRT give sufficient and high quality bed-side teaching during consultation	6.43 (6.23-6.62)	6.51 (6.34-6.68)	0.583
Negative experiences with the members of the RRT in the previous three months?			
The members of the RRT were unfriendly and not cooperative to the ward nurse and physician during consultation	2.14 (1.90-2.41)	2.09 (1.88-2.31)	0.799
Members of the RRT gave the feeling that they were called unnecessarily	2.52 (2.29-2.77)	2.39 (2.18-2.60)	0.424
The members of the RRT give the impression that the daily care on the ward is insufficient	2.56 (2.32-2.80)	2.64 (2.45-2.86)	0.555
Possible delays in the RRS protocol			
Nurses frequently activate the RRT instead of physicians	3.27 (3.04-3.49)	3.74 (3.54-3.96)	0.005
The physicians of the ward adhere to the time frame to call the RRT	4.91 (4.72-5.09)	4.78 (4.57-4.97)	0.350
The RRT is always present within 10 minutes after the RRT call	6.87 (6.69-7.07)	6.98 (6.80-7.16)	0.142

Questionnaire 7 and 14 months after implementation of RRT. Response to questions was scored on a scale from 0-10 (0=totally disagree or never, 10= totally agree or always. All data are presented as mean and 95% CI. Data were derived from answers to questions 3-21 of the questionnaire (see appendix A).

Table 3. Association of characteristics of respondents with RRS-related behavior and satisfaction

	Timing^ (14 months versus 7 months)		Female versus male*		Surgical versus medical~		Experience with patients with MEWS >3°		Age (Years)		Work experience (years)	
Use of MEWS/SBAR	RR (95%CI)	*p-value*	RR (95%CI)	*p-value*	RR (95%CI)	*p-value*	RR (95%CI)	*p-value*	RR (95%CI)	*p-value*	RR (95%CI)	*p-value*
If my patient had a MEWS ≥ 3, I always call the physician of the ward immediately	1.182 (0.974-1.034)	0.091	*NS*		1.389 (1.168-1.650)	0.000	*NS*		*NS*		*NS*	
I always use the SBAR communication tool in the communication between the nurse and physician	*NS*		*NS*		1.157 (1.029-1.302)	0.015	*NS*		*NS*		1.008 (1.004-1.013)	0.000
The RRS is fully incorporated in the daily care we provide to our patients on the ward	1.429 (1.271-1.605)	0.000	*NS*		1.406 (1.179-1.678)	0.000	*NS*		*NS*		*NS*	
The management of the ward on my nursing ward supports the RRS concept	*NS*		*NS*		4.878 (2.597-9.091)	0.000	1.326 (0.959-1.835)	0.089	1.018 (0.998-1.038)	0.084	0.979 (0.959-1.000)	0.051
Explaining the MEWS/SBAR and RRT procedure to a new colleague is not a problem	1.311 (1.086-1.605)	0.005	1.383 (1.001-1.908)	0,049	1.585 (1.259-1.996)	0.000	*NS*		*NS*		*NS*	
Satisfaction using MEWS/SBAR and RRT procedure												
What is your general opinion about the MEWS tool?	1.479 (1.059-2.066)	0.021	*NS*		2.141 (1.277-3.597)	0.004	*NS*		*NS*		*NS*	
What is your general opinion about the use of SBAR communication tool?	*NS*		*NS*		*NS*		*NS*		0.982 (0.962-1.004)	0.110	1.024 (1.002-1.047)	0.036
What is your general opinion about the RRT?	1.887 (1.403-2.532)	0.000	*NS*		2.475 (1.479-4.149)	0.001	*NS*		*NS*		*NS*	
The use of the MEWS/SBAR tool and RRT procedure creates an unbalanced increase in workload	0.723 (0.873-0.598	0.001	*NS*		*NS*		*NS*		*NS*		0.985 (0.975-0.995)	0.004
Using the MEWS/SBAR tool, deteriorated patients were identified earlier	1.344 (1.044-1.733)	0.022	*NS*		1.451 (1.156-1.821)	0.001	*NS*		1.013 (1.002-1.025)	0.021	*NS*	
The RRT is of an added value over using the MEWS/SBAR tool in early recognition and treatment of deteriorated patient	1.460 (1.209-1.761)	0.000	*NS*		1.855 (1.600-2.146)	0.000	*NS*		*NS*		*NS*	
The presence of the RRT procedure in our hospital makes sure that physicians review deteriorated patients earlier than before	*NS*		*NS*		1.957 (1.634-2.347)	0.000	*NS*		*NS*		1.013 (1.003-1.024)	0.010
The RRS is very relevant for my daily activities and I will keep using this in the future	1.773 (1.294-2.427)	0.000	*NS*		2.793 (1.887-4.132)	0.000	*NS*		*NS*		*NS*	
The RRS is an essential part of the daily care and should be employed in all hospitals?	1.520 (1.224-1.887)	0.000	*NS*		2.801 (1.898-4.132)	0.000	*NS*		0.979 (0.956-1.003)	0.087	1.025 (1.002-1.049)	0.037
Rapid Response Team												
The members of the RRT are kind and helpful during consultation?	1.848 (1.253-2.725)	0.002	1.821 (1.295-2.564)	0,001	1.645 (1.095-2.463)	0.016	1.534 (0.980-2.398)	0.061	*NS*		*NS*	
The members of the RRT have a low threshold to contact and are easily reachable	1.555 (1.175-2.058)	0.002	1.502 (1.013-2.227)	0,043	1.563 (1.171-2.088)	0.002	1.412 (1.048-1.923)	0.028	*NS*		*NS*	
The members of the RRT give sufficient and high quality bed-side teaching during consultation	*NS*		*NS*		1.524 (1.181-1.969)	0.001	*NS*		*NS*		*NS*	

Table 3. (cont.)

	Timing^ (14 months versus 7 months)		Female versus male *		Surgical versus medical~		Experience with patients with MEWS >3°		Age (Years)		Work experience (years)	
In the last three months negative experiences with the members of the RRT?												
The members of the RRT were unfriendly and not cooperative to the ward nurse and physician during consultation	*NS*		*NS*		0.618 (0.321-1.190)	0.150	*NS*		*NS*		*NS*	
Members of the RRT gave the feeling that they were called unnecessarily	*NS*		*NS*		0.613 (0.421-0.894)	0.011	*NS*		1.018 (1.001-1.035)	0.040	*NS*	
The members of the RRT give the impression that the daily care on the ward is insufficient	*NS*		*NS*		*NS*		*NS*		1.000 (0.990-1.010)	0.962	*NS*	
Is there any delay in the process?												
Nurses frequently activate the RRT instead of physicians	1.073 (1.013-1.138)	0.017	*NS*		1.093 (0.999-1.196)	0.053	0.872 (0.822-0.925)	0.000	0.994 (0.991-0.997)	0.000	1.004 (1.000-1.008)	0.037
The physician of the ward stick to the time frame to call the RRT	*NS*		*NS*		*NS*		NS		1.008 (1.000-1.016)	0.045	0.993 (1.000-1.001)	0.097
The RRT is always present within 10 minutes after the RRT call	1.200 (0.996-1.449)	0.056	*NS*		1.307 (1.124-1.522)	0.001	NS		*NS*		*NS*	

Relative Risk of characteristics of respondents with RRS-related behaviors and satisfaction. RR > 1 indicates higher satisfaction or agreement with statement. Response to questions was originally scored on a scale from 0-1- (0=totally disagree or never,10=totally agree or always). For this analysis answers were dichotomously recoded in a way that scores from 0-5 means 'no' or 'disagree' and 6-10 means 'yes' or 'agree'. Data were derived from answers to questions 3-21 of the questionnaire (see Appendix A). ^Time of questionnaire – 14 months versus 7 months, * Gender – female versus male, ~Ward-surgical versus medical, °Observing patient with MEWS > 3 in the last two week, ≥ 1 patients versus 0 patients.

Table 3 reports the results of the generalized estimating equation analysis. In the table, the Relative Risk (RR) for agreement with a certain statement of the survey is given for time of questionnaire (14 months versus 7 months), gender (female versus male), ward (surgical versus medical), observing patients with a MEWS ≥ 3 in the last week (≥ 1 patient versus 0 patients), age and work experience (years) are reported. For almost all statements, compliance of respondents and ward managers with the RRS as well as satisfaction with the RRS was higher at 14 months compared to 7 months, and also higher in respondents working on surgical vs. medical wards. More years of experience as nurse or physician were associated with higher compliance and satisfaction for some but not all statements. Gender, age and experience with patients with MEWS > 3 showed no association with agreement with the given statements.

Table 4. Multivariate analysis exploring the association of different aspects of the RRS (demographic and process related items) and overall satisfaction with RRS

	RR (95% CI)	p-value
Support of RRS by management of my ward	3.497 (1.802-6.803)	0.000
Members of the RRT are kind and helpful during consultation	4.149 (1.825-9.434)	0.001
Members of the RRT has a low threshold to contact and are easily reachable	NS	
Members of the RRT give sufficient and high quality bed-side teaching during consultation	NS	
Members of the RRT gave the feeling that they were called unnecessarily	NS	
Members of the RRT give the impression that the daily care on the ward is insufficient	NS	
Nurses frequently activate the RRT instead of physicians	NS	
The physician of the ward stick to the time frame to call the RRT?	NS	
The RRT is always present within 10 minutes after the RRT call	NS	
Timing (14 months versus 7 months)	1.495 (0.959-2.331)	0.076
Surgical versus Medical ward	NS	

Relative Risk (RR) of characteristics of respondents with RRS-related behaviors and satisfaction. RR > 1 indicates higher satisfaction or agreement with statement. Response to questions was originally scored on a scale from 0-1-(0=totally disagree or never,10=totally agree or always). For this analysis answers were dichotomously recoded in a way that scores from 0-5 means 'no' or 'disagree' and 6-10 means 'yes' or 'agree'. Data were derived from answers to questions that were related in our opinion to the process (see Appendix A).

The multivariable analysis on factors associated with overall satisfaction with the RRT is shown in Table 4. Independent predictors of satisfaction were duration of experience with the RRS (14 versus 7 months after implementation of the RRS), support of the RRS by local ward management, and having an RRT considered to be 'open' and 'approachable'.

Discussion

In this study we found that nurses and physicians working on hospital wards in the Netherlands are generally very satisfied with the services offered by the RRT, with the MEWS instrument to recognize patients at risk and with the SBAR communication tool to improve communication about deteriorating patients between nurses and doctors. At 14 months after implementation of the RRT, respondents valued these components of the Rapid Response System even more than at 7 months after implementation. Accordingly, we found high agreement of respondents with the statement that RRTs should be installed in all hospitals and that they were willing to use it in the future.

Our findings from the Netherlands are in agreement with earlier reports on attitudes of healthcare workers regarding RRTs. Studies from Saudi Arabia [11], Australia [9,12], Italy [13] and Canada [8] and the USA [14] all reported very high satisfaction with RRTs by nurses and doctors. RRTs were believed to prevent cardiac arrests [8,12] and allowed nurses to seek help if they were worried about their patients. [8] We found that nurses and physicians at surgical wards expressed higher satisfaction with the RRT than colleagues at medical wards. The use of the different components of the RRT-system was also higher at surgical wards and the local leadership at the surgical ward was more supportive regarding the RRT than at medical wards. The same difference in attitudes towards the RRT between surgical and medical wards was also reported in studies from Italy, Australia and Canada. [8,13,15] It has been suggested that the benefits from an RRT may be more pronounced on a surgical ward because surgeons are more often busy at the operation room and not available for care at the ward. Furthermore, many doctors and nurses of surgical wards feel inadequate in managing critical patients and are accustomed to relying on external consultants for managing medical problems. [13] As severe adverse events are common after surgery, RRTs may be especially beneficial in these patients. Indeed, Bellomo and co-workers reported that an RRT resulted in a 58% relative risk reduction in adverse outcomes and a 44% reduction in emergency ICU admissions after major surgery. [16]

In general, no association was found between satisfaction with RRT and either gender, experience with more than one deteriorated patients in the last two weeks, age of the respondent or years of experience in healthcare. Only few individual statements did show such an association. More years of experience were associated with more agreement with the statement 'I always use the SBAR communication tool in the communication between nurse and physician', and also with the statement 'an RRT in the hospital means that deteriorated patients are reviewed earlier'. In other studies seniority of nurses was shown to be associated with a higher appreciation of the RRT. [13] In our multivariate analysis, an RRT considered to be 'open' and 'approachable' during

consultation was associated with higher overall satisfaction with the RRT by healthcare workers. This can be a direct positive effect of being kind and helpful. If so, RRTs should be urged to be kind and helpful to help implement the rapid response system in hospitals. Alternatively, it is also possible that nurses and doctors who are satisfied with the RRT for other reasons also are more positive about how the RRT operates.

High satisfaction with an RRT found in our study is not necessarily representative for large-scale implementation in real life settings. We cannot exclude that implementation measures such as information and education were more intense and local leadership was more involved because our implementation of RRTs was part of a scientific study. However, we belief that this was unlikely. First, as this was a large study in 12 hospitals involving 166,569 patients, without external funding, implementation measures were mostly limited to informing all nurses and physicians and offering pocket cards with a MEWS and SBAR summary. This would not be very different in 'normal' implementations. Second, implementation was mostly done in the first months before and after the start of the RRT; if our study would have applied unrealistic implementation measures, one would expect highest appreciation of the RRT in the first period. In contrast, we found that satisfaction with the RRT actually increased over time between 7 and 14 months after start of the RRT. In our study questionnaires were distributed anonymously among physicians and nurses. As a limitation, because of the anonymity, we could not establish who returned the questionnaires during the two time points. Therefore, we considered the questionnaires as unrelated and used for analysis the independent samples t-test.

Conclusion

In conclusion, our findings show that healthcare workers generally are very satisfied with RRTs in their hospital. In addition to direct beneficial effects on relevant patient outcomes, this in itself is an argument in favour of implementing RRTs in all hospitals.

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Appendix A. Questionnaire used to assess satisfaction of nurses and physicians during the introduction of Rapid Response Systems in Dutch Hospitals during the RRT introduction phase (translation from Dutch version)

This questionnaire was used during the Rapid Response Team (RRT) implementation phase. Nurses and physicians obtained this questionnaire in the 7th and 14th month after introduction of the Rapid Response Team in their respective hospital.

Part A. Use of MEWS/SBAR

1. In the previous two weeks, how often did you have to deal with a patient who had a MEWS ≥3 or more? (one answer possible)
   - ☐ 0 patients (proceed to question 3)
   - ☐ 1-3 patients
   - ☐ 4-6 patients
   - ☐ 7-10 patient
   - ☐ More than 10 patients
   - ☐ Don't know

2. What is the percentage of patients with a MEWS ≥3 were the RRT was actually called for assistance? (one answer possible)
   - ☐ 0%
   - ☐ 1-25%
   - ☐ 26-50%
   - ☐ 51-75%
   - ☐ 76-100%
   - ☐ Don't know

Can you, on a scale from 0 - 10, describe your opinion regarding the following statements. Please circle your grade.

3. If a patient who I'm taking care for has a MEWS ≥3, I always call the physician of the ward immediately.

0	1	2	3	4	5	6	7	8	9	10

Never Always

4. Regarding the communication between the nurse and physician on the ward, if the patient has a MEWS ≥3, I always use the SBAR communication tool to discuss the situation of the patient.

0	1	2	3	4	5	6	7	8	9	10

Totally disagree Totally agree

5. The RRS (MEWS/SBAR and RRT) is fully incorporated in the daily care we provide to our patients on the ward.

0	1	2	3	4	5	6	7	8	9	10

Totally disagree Totally agree

6. The management of the ward on my nursing ward supports the RRS concept.

0	1	2	3	4	5	6	7	8	9	10

Totally disagree Totally agree

7. When training a new colleague on the ward, explaining the use of the MEWS/SBAR and RRT procedure, is not a problem and this colleague is able to use it immediately in daily practice.

0	1	2	3	4	5	6	7	8	9	10

Totally disagree Totally agree

Part B. Satisfaction using MEWS/SBAR and RRT procedure

8. What is your general opinion about the MEWS tool?

0	1	2	3	4	5	6	7	8	9	10

Poor Excellent

9. What is your general opinion about the use of SBAR communication tool?

0	1	2	3	4	5	6	7	8	9	10

Poor Excellent

10. What is your general opinion about the RRT?

0	1	2	3	4	5	6	7	8	9	10

Poor Excellent

11. The use of the MEWS/SBAR tool and RRT procedure creates an unbalanced increase in workload.

0	1	2	3	4	5	6	7	8	9	10

Totally disagree Totally agree

12. Employing the MEWS/SBAR tool, deteriorating patients were identified and/or managed earlier by the resident physician thus preventing a potential small problem would no escalate into a bigger problem such as cardiac arrest, unplanned Intensive Care admission or death.

0	1	2	3	4	5	6	7	8	9	10

Totally disagree Totally agree

13. The added value of the RRT compared to employing only the MEWS/SBAR tool, creates a significant clinical benefit in the early recognition and treatment of deteriorating patients by preventing small problems becoming large problems such as a cardiac arrest, unplanned Intensive Care admission or death.

0	1	2	3	4	5	6	7	8	9	10

Totally disagree Totally agree

14. The presence of the RRS procedure in our hospital makes sure that physicians review deteriorated patients earlier than before.

0	1	2	3	4	5	6	7	8	9	10

Totally disagree Totally agree

15. The RRS is very relevant for my daily activities and I will keep using in the future.

0	1	2	3	4	5	6	7	8	9	10

Totally disagree Totally agree

16. The RRS is an essential part of the daily care and should be employed in all the hospitals.

0	1	2	3	4	5	6	7	8	9	10

Totally disagree Totally agree

Part C. Rapid Response Team

17. In your opinion, how satisfied are you with the members of the Rapid Response Team with regard to
    a. The kindness and helpfulness during consultation

0	1	2	3	4	5	6	7	8	9	10

Totally dissatisfied Totally satisfied

    b. The RRT has a low threshold to contact and are easily reachable

0	1	2	3	4	5	6	7	8	9	10

Totally dissatisfied Totally satisfied

    c. They give sufficient and high quality bed-side teaching during consultation

0	1	2	3	4	5	6	7	8	9	10

Totally dissatisfied Totally satisfied

18. Did you have a negative experience in the last 3 months with members of the RRT?
    a. The members of the RRT were unfriendly and uncooperative to the ward nurse and physician during consultation.

0	1	2	3	4	5	6	7	8	9	10

Never Always

    b. The members of the RRT gave the feeling that they were called unnecessarily

0	1	2	3	4	5	6	7	8	9	10

Never Always

    c. The members of the RRT give the impression that the daily care on the ward is insufficient.

0	1	2	3	4	5	6	7	8	9	10

Never Always

Part D. Possible delays in the RRS protocol

19. Nurses frequently activate the RRT instead of physicians.

0	1	2	3	4	5	6	7	8	9	10

Totally disagree Totally agree

20. The physician of the ward adhere to the time frame to call the RRT (0.5 hour review patient and make a policy, 1 hour to evaluate treatment effect)

0	1	2	3	4	5	6	7	8	9	10

Totally disagree Totally agree

21. The RRT is always present within 10 minutes after the RRT call.

0	1	2	3	4	5	6	7	8	9	10

Totally disagree Totally agree

Part E. Education and information with respect to MEWS/SBAR tool and RRT procedure

22. Did you receive information by the study coordinators about the toolkit/presentation/email etcetera about the MEWS/SBAR tool and RRT procedure?
    - ☐ Yes (proceed to question 23)
    - ☐ No (proceed to question 24
    - ☐ Don't know (proceed to question 24)

23. If so, did you fill out a survey/exam after the training?
    - ☐ Yes
    - ☐ No
    - ☐ Don't know

24. How would you grade the quality of the education materials (toolkit, hand-outs, pocket cards and oral presentation) at the start of the RRT introduction phase?

0	1	2	3	4	5	6	7	8	9	10
Poor										Excellent

Part F. General questions regarding care provider demographic

1. Hospital name ……
2. Date of filling in questionnaire __/__/____ (dd/mm/yyyy)
3. Gender Male/Female
4. Age __
5. What is your profession?
    - ☐ Nurse
    - ☐ Student Nurse
    - ☐ Resident
    - ☐ Specialist
6. Name of current ward and speciality ……
7. Years post-graduation __ (yy)
8. Employment at current hospital __ (mm)
9. Employment at current ward __ (mm)

Legend

MEWS - Modified Early Warning Score, SBAR – Situation Background Assessment Recommendation, RRT – Rapid Response Team, RRS – Rapid Response System