Psychiatr Q (2015) 86:625–632
DOI 10.1007/s11126-015-9356-4

ORIGINAL PAPER

Medical Rapid Response in Psychiatry: Reasons for Activation and Immediate Outcome

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Published online: 22 March 2015

Abstract Rapid response teams are used to improve the recognition of acute deteriorations in medical and surgical settings. They are activated by abnormal physiological parameters, symptoms or clinical concern, and are believed to decrease hospital mortality rates. We evaluated the reasons for activation and the outcome of rapid response interventions in a 222-bed psychiatric hospital in New York City using data obtained at the time of all activations from January through November, 2012. The primary outcome was the admission rate to a medical or surgical unit for each of the main reasons for activation. The 169 activations were initiated by nursing staff (78.7 %) and psychiatrists (13 %) for acute changes in condition (64.5 %), abnormal physiological parameters (27.2 %) and non-specified concern (8.3 %). The most common reasons for activation were chest pain (14.2 %), fluctuating level of consciousness (9.5 %), hypertension (9.5 %), syncope or fall (8.9 %), hypotension (8.3 %), dyspnea (7.7 %) and seizures (5.9 %). The rapid response team transferred 127 (75.2 %) patients to the Emergency Department and 46 (27.2 %) were admitted to a medical or surgical unit. The admission rates were statistically similar for acute changes in condition, abnormal physiological parameters, and clinicians' concern. In conclusion, a majority of rapid response activations in a self-standing psychiatric hospital were initiated by nursing staff for changes in condition, rather than for policy-specified abnormal physiological parameters. The findings suggest that a rapid response

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system may empower psychiatric nurses to use their clinical skills to identify patients requiring urgent transfer to a general hospital.

Keywords Rapid response · Psychiatric hospitals · Acute medical deteriorations

Introduction

In December 2004, the influential Institute for Healthcare Improvement launched a national initiative aiming to save the life of 1,00,000 patients through improvements in the effectiveness and safety of the care delivered in U.S. hospitals [1]. Among the six specific interventions recommended by the think-tank, the first was the deployment of rapid response teams (RRTs) staffed by physicians, nurses and medical technicians with critical care skills and experience, which was thought to prevent cardiac arrests by facilitating transfers to an intensive care unit. At the time of the recommendation, RRT's had been widely implemented in Australia and United Kingdom and had become common in the United States as well, but there was only weak evidence that they had produced a decrease in cardiac arrest rates and hospital mortality [2]. A systematic review of RRT effectiveness, involving 1.3 million hospital admissions up to 2008, indicated a significant reduction in the rate of cardiopulmonary arrests outside intensive care settings, but no effect on overall mortality [3]. However, when higher quality data sets had been analyzed, two meta-analyses showed a decrease in hospital mortality, which was attributed to improved implementation strategies and maturation of the teams' intervention, but also to secular trends unrelated to the RRT systems [4, 5].

The reasons for activation of the rapid response team in general hospitals have been carefully evaluated in only one study, performed in a 580-bed tertiary referral center and teaching hospital in Sydney, Australia [6]. The common (greater than 10 % of total) specified reasons for the 713 calls were change in level of consciousness (21.7 %), systolic blood pressure <90 mm Hg (19.9 %), respiratory rate >35 min^{-1} (15.3 %), seizure (11.1 %), and heart rate >140 min^{-1} (10.8 %). "Worried" alone was invoked for 11.8 % of the calls. Hypotension and "worried" were the two most common reasons for calling the emergency medical team and together with tachypnea and change in level of consciousness accounted for 70 % of all calls in a larger sample from two hospitals at the same Australian location [7].

RRTs have not been introduced in self-standing psychiatric hospitals, most likely because cardiorespiratory arrests are infrequent in these settings [8, 9]. These hospitals are not equipped to provide inpatient-level medical or surgical services and usually rely on outside consultants to evaluate and manage major medical issues [10, 11]. Acute deteriorations requiring transfers to medical or surgical units occur in 2.1–6.8 % of psychiatric admissions [10, 11]. In a recent study, a majority of medical deteriorations in a psychiatric hospital were due to pneumonia, new neurologic deficits, gastrointestinal bleeding, respiratory distress with gas-exchange failure, urinary retention, arrhythmias, syncope and marked hypotension [11], conditions that may lead to life-threatening complications if they are not rapidly diagnosed and treated.

Rapid response systems rely on optimal performance of its two components, the "activators" and the "responders". In general hospitals, both "activators" and "responders" are physicians and nurses trained and experienced in recognizing and handling acute

deteriorations and medical emergencies [5]. Such cognitive and practical skills are particularly important for RRT activations due to changes in condition rather than abnormal parameters. In psychiatric settings, the "callers" will have to be psychiatric nurses or psychiatrists, who may or may not have such expertise. In this report we evaluate the RRT activations over a 10-month period in a self-standing psychiatric hospital and compare the frequency and outcome of RRT calls triggered by policy-specified physiological parameters versus those initiated for clinical concerns.

Materials and Methods

Setting and Patients

The study was performed using data generated by all RRT activations from February through November 2012 in a 222-bed self-standing, private, and not-for-profit psychiatric teaching hospital located in New York City.

The RRT system was implemented in January 2012. The team comprises two on-call psychiatry residents, two registered nurses and a nurse-manager. The RRT is activated via voice message to its members' beepers. A board-certified internal medicine specialist was available on-site for urgent consultation with the RRT 9 AM–5 PM Monday through Friday and by phone at all other times.

RRT Activation Criteria

The RRT was called for policy-specified abnormalities in physiological parameters, acute changes in condition, or concern about the patient. For patients thought to be in cardiac arrest a "Code Blue" resuscitation team was called.

The policy-specified abnormalities were respiratory rate <8 min^{-1} or >30 min^{-1}, oxygen saturation <90 % on room air as measured by pulse oximetry; heart rate <40 beats/min or >130 beats/min; systolic blood pressure <90 mm Hg; orthostatic systolic blood pressure change >30 mm Hg if asymptomatic or >20 mm Hg if dizzy or weak; systolic blood pressure >180 mm Hg or diastolic blood pressure >110 mm Hg if asymptomatic; systolic blood pressure >150 mm Hg or diastolic blood pressure >90 mm hg if associated with headache, nausea, vomiting, weakness, chest pain, dyspnea, visual changes; ear temperature <95 F or >103 F; urinary output <50 cc/h over a 4 h period; and point of care glucose level <60 mg/dL.

RRT Intervention

The patients with medical conditions that could not be managed in the psychiatric setting were transferred to the Emergency Department of the general hospital. The Emergency Department has its own imaging capability, including computerized tomography and ultrasonography, and immediate access to consultants from all medical and surgical specialty services. Patients were held in the Emergency Department for up to 4 h for investigation and treatment. When the condition could not be satisfactorily treated in the Emergency Department, the patient was admitted to a medical and surgical unit. Physicians employed by the psychiatric hospital were not involved in the clinical decisions made after the patients' transfer to the Emergency Department.

Data Collection

Data collected for each RRT activation included the time of call, professional qualification of person calling (e.g., psychiatrist or staff nurse), reason for calling, and outcome, i.e., treated on-site, transferred to Emergency Department and returned to psychiatric hospital, or transferred and admitted to the general hospital. The retrospective study was performed according to a protocol approved by the Institutional Review Board, North Shore - Long Island Jewish Health System, Manhasset, New York.

Statistical Analyses

Two-tailed χ^2 tests with Yates' correction for continuity or Fisher Exact tests as appropriate for the number of subjects, were used to compare the frequencies of transfers admissions for RRT activations due to policy-specified abnormal physiological parameters, acute changes in condition, and non-specified concern. The significance level for p values was adjusted with the Bonferroni's correction for multiple comparisons.

Results

RRT Activators

There were 169 RRT activations during the 10-month study, involving 92 males and 77 females with a mean age of 49.0 years (range 11–93). A substantial majority of the activators (72.8 %) were staff nurses. Other callers included psychiatrists, nurse practitioners and clinical social workers (Table 1). Seven RRT calls were for patients 11–18 years of age and 20 for patients older than 64. During the period of study two patients, not included in the RRT cohort, suffered cardiac arrests for which a resuscitation team was called.

Reasons for RRT Activation

The RRT was activated for 24 specified reasons (Table 2). In 14 (8.3 %) cases the reason for activation was a concern that the patient's condition was deteriorating.

Close to two-thirds of all calls (64.5 %) followed the recognition of an acute, symptomatic change in the patients' physical or mental status. The most common reasons for the 109 RRT activations in this category were chest pain in 24 patients, fluctuating level of consciousness in 16, syncope and/or fall in 15, dyspnea in 13, and seizures in 10. Taken together, these 5 entities were the reason for 71.6 % of calls in this category and almost half (46.2 %) off all RRT activations. Among the less common issues were two episodes of choking requiring Heimlich maneuver, two instances of hyperglycemia with glucose levels

Table 1 Person calling the RRT

Registered nurse	123 (72.7 %)
Physician	22 (13.0 %)
Nurse practitioner	10 (5.9 %)
Clinical social worker	3 (1.9 %)
Not specified	11 (6.5 %)

Table 2 Reasons for RRT activation

Acute change in condition	109 (64.5 %)
Chest pain	24
Fluctuating level of consciousness	16
Syncope or fall	15
Dyspnea	13
Seizure	10
Dizziness	6
Abdominal pain	4
Allergic reaction	3
Laceration	3
Headache	2
Diaphoresis	2
Vomiting	2
Choking	2
Hyperglycemia	2
Ataxia	1
Tremor	1
Palpitations	1
Diplopia	1
Overdose	1
Abnormal physiological parameter	46 (27.2 %)
Hypertension	16
Hypotension	14
Hypoglycemia	7
Abnormal Heart Rate	4
Hypoxia	3
Fever	2
Concern, non-specific	14 (8.3 %)

>500 mg/dL, two allergic reactions with significant tongue swelling creating the risk of airway obstruction, and one overdose with concealed drugs.

A policy-specified physiological parameter justified 46 (27.2 %) of RRT activations. A majority of these calls (65.2 %) were in response to finding high or low blood pressure on routine checking of vital signs. The other reasons in this category were hypoglycemia, abnormal heart rate, hypoxia and fever (Table 2).

Outcome

The RRT transferred 127 (75.2 %) patients to the Emergency Department. The emergency medicine attending physicians decided that 46 patients required admission to a medical or surgical unit. The admission rates, calculated as percentage from the total RRT activations, were statistically similar for the three groups (Table 3).

The proportions of patients transferred and the proportions of those transferred who were admitted were 85.3 and 34.4 % for patients with acute change in condition, 50 and 52.2 % for those with policy-specified abnormal physiological parameters, and 78.6 and

Table 3 Immediate outcomes of RRT activation

Reason for activating RRT	Transfer to Emergency Department $N = 169$	Admitted to general hospital $N = 169$
Acute change in condition	93 (55.0 %)	32 (18.9 %)
Abnormal physiological parameter	23 (13.6 %)	12 (7.1 %)
Concern, not specified	11 (6.5 %)	2 (1.2 %)
Total	127 (75.2 %)	46 (27.2 %)

9.1 % for RRT activations due to concern. The differences in these proportions were also statistically insignificant.

Seven of the transferred patients were 11–18 years of age and one was admitted. In contrast, there were 12 admissions among the 20 transferred patients who were 65 years of age or older.

Discussion

In a free-standing psychiatric hospital, the RRT system was activated predominantly for acute changes in condition (64.5 %), rather than for abnormal physiological parameters (27.2 %). As expected, a substantial majority of the RRT intervention was initiated by nursing staff. Three-quarters of all activations led to transfer to a general hospital to which one in three patients transferred were admitted. The most common reasons for activating the RRT were chest pain (14.2 %), fluctuating level of consciousness (9.5 %), hypertension (9.5 %), syncope or fall (8.9 %), hypotension (8.3 %), dyspnea (7.7 %) and seizures (5.9 %). The admission rates were statistically similar for acute changes in condition, abnormal physiological parameters, and clinicians' concern. The rates of transfers and admissions for specific reasons were highly variable. For example, seven of the 16 patients with hypertension were transferred and three admitted, while of the 14 patients with hypotension, 10 were transferred and six admitted. Eleven of the 16 patients with fluctuating level of consciousness were sent to the Emergency Department and six were admitted. Of the seven patients with hypoglycemia, only one was transferred, but did not require admission.

The findings must be interpreted cautiously, because the data were collected in a single hospital, which may have different standards and practices for medical evaluation than other free standing psychiatric institutions in the United States and elsewhere. The design did not allow the precise assessment of the decisions to transfer, as they were subject to ad-hoc clinical judgments and influenced by the daily change in RRT members. The study was not controlled, because a double-blind RRT intervention in a single hospital is ethically untenable [4].

Our data indicate that the psychiatric nurses used clinical assessments of a large variety of symptoms to decide whether to activate the medical emergency response. The break with the traditional pattern in which the patient's psychiatrist would call a medical consultant appeared to have been accepted by all parties involved and to give nurses more authority. The findings are consistent with the observation that RRT systems enable nurses to use independent judgment, thus bypassing a hierarchical structure of nurse managers and physicians [4, 12]. In a recent Canadian survey, a near unanimity (94 %) of nurses felt that the RRT system allows them to seek help for patients they worried about, 48 % would

activate the RRT for such patients even if the vital signs were normal, and only 2.2 % believed that the system was overused [13]. In a U.S. survey, 84 % of staff nurses felt that the RRT system improved their work environment and 65 % indicated the presence of an RRT as a factor when seeking a new job [14].

As this is the first observational study of RRT implementation in a psychiatric hospital, the results must be confirmed by larger, multicenter investigations. Nevertheless, the system appears useful for the rapid recognition of patients that exceed the medical capabilities of most free-standing mental health institutions and for increasing their staff's autonomy in addressing acute medical deteriorations.

References

1. Berwick DM, Calkins DR, McCannon CJ, Hackbarth AD: The 1,00,000 lives campaign: Setting a goal and a deadline for improving health care quality. JAMA 295:324–327, 2006.
2. Winters BD, Pham JC, Hunt EA, Guallar E, Berenholtz S, Pronovost PJ: Rapid response systems: A systematic review. Critical Care Medicine 35:1238–1243, 2007.
3. Chan PS, Jain R, Nallmothu BK, Berg, RA, Sasson C: Rapid response teams: A systematic review and meta-analysis. Archives of Internal Medicine 170:18–26, 2010.
4. Laurens NH, Dwyer TA: The effect of medical emergency teams on patient outcome: A review of the literature. International Journal of Nursing Practice 16:533–544, 2010.
5. Winters BD, Weaver SJ, Pfoh ER, Yang T, Pham JC, Dy SM: Rapid-response systems as a patient safety strategy: A systematic review. Annals of Internal Medicine 158:417–425, 2013.
6. Parr MJ, Hadfield JH, Flabouris A, Bishop G, Hillman K: The medical emergency team: 12 month analysis of reasons for activation, immediate outcome and not-for-resuscitation orders. Resuscitation 50:30–44, 2001.
7. Young L, Donald M, Parr M, Hillman K: The medical emergency team system: A two hospital comparison. Resuscitation 77:180–188, 2008.
8. Manu P, Kane JM, Correll CU: Sudden death in psychiatric patients. The Journal of Clinical Psychiatry 72:936–941, 2011.
9. Ifteni P, Correll CU, Burtea V, Kane JM, Manu P: Sudden unexpected death in schizophrenia: Autopsy findings in psychiatric inpatients. Schizophrenia Research 155:72–76, 2014.
10. Leung MW, Xiong GL, Leamon MH, McCarron RM, Hales RE: General-Medical Hospital admissions from a public inpatient psychiatric health facility: A review of medical complications over 30 months. Psychosomatics 51:498–502, 2010.
11. Manu P, Asif M, Khan S, Ashraf H, Mani A, Guvenek-Cokol P, Lee H, Kane JM, Correll CU: Risk factors for medical deterioration of psychiatric inpatients: Opportunities for early recognition and prevention. Comprehensive Psychiatry 53:968–974, 2012.
12. Tee A, Calzavacca P, Licari E, Goldsmith D, Bellomo R: Bench-to-bedside review: The MET syndrome—the challenges of researching and adopting medical emergency teams. Critical Care 12:205, 2008.
13. Bagshaw SM, Mondor EE, Scouten C et al: A survey of nurses' beliefs about the medical emergency team system in a Canadian tertiary hospital. American Journal of Critical Care 19:74–83, 2010.
14. Galhotra S, Scholle CC, Dew MA, et al: Medical emergency teams: A strategy for improving patient care and nursing wprk environments. Journal of Advanced Nursing 55:180–187, 2006.

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