A retrospective cohort study of the effect of medical emergency teams on documentation of advance care directives

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ABSTRACT

Objective: To describe the longitudinal changes in documentation of advance care directives (ACDs), including limitation of medical therapy (LMT) and not-for-resuscitation (NFR) directives among patients reviewed by a medical emergency team (MET).

Design and setting: Single-centre, retrospective cohort study at a tertiary teaching hospital in Wellington, New Zealand, from 1 October 2009 to 30 September 2010.

Participants: Adult surgical and medical inpatients attended by the hospital's MET, which attends medical emergency calls and cardiac arrest calls.

Main outcome measures: Chronology of LMT and NFR documentation rates in relation to hospital admission and MET attendance. Medical compliance with hospital NFR documentation policy. Differences in characteristics and outcomes of patients with and without documented ACDs.

Results: Documentation of LMT and NFR directives at admission was low (18%) in the 71 patient files included in the study. The LMT and NFR directive documentation rate before MET review (32%) doubled after MET involvement (62%). Universal NFR directive documentation was not achieved (66% NFR rate). Presence of pre-MET ACDs were associated with increased age, but this group had similar comorbidities and mortality rates to the group without directives. Presence of ACD documentation after MET review was associated with increased age, comorbidity burden and inhospital mortality.

Conclusions: Compliance with hospital policy of universal documentation was low despite MET involvement. There was a strong association between ACDs and death, suggesting an opt-out culture. Further investigation is needed into the interaction between hospital systems, medical culture, human factors, and patient-centred clinical decision making.

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A patient in a deteriorating condition represents a scenario[1] of an unpredictable health care trajectory and is a globally recognised health issue[2,3] that is currently being targeted by quality and safety initiatives.[4,5] Medical emergency teams (METs) provide a systematic approach to facilitate urgent, coordinated assessment and care of patients whose clinical conditions are deteriorating.[6,7]

Time-critical decisions made by a MET may result in the continuation of current management, escalation of treatment to a critical care environment, implementation of a limitation of medical therapy (LMT) directive, or withdrawal of components of therapy and a transition to palliative care.[8,9] A MET may review an incompetent patient in circumstances where the primary treatment team and/or family are not immediately available. There is evidence that patients and families benefit from accurate clinical documentation in the form of an advance care directive (ACD) to ensure appropriate care aligned with expressed wishes.[10]

Documentation of a patient's wishes varies across health care jurisdictions and cultures.[11-13] The prevalent "opt-out" system assumes a requirement for full resuscitation in the absence of clear documentation to the contrary.[14] Failure to document a discussed LMT directive may, therefore, result in inappropriate or unwanted treatment.[15] There is increasing interest in patient-centredness and systematic quality assurance of this process.[10,16-20] Members of the MET may participate in decision making regarding withdrawal of active care.[8]

There is limited information about MET systems and their role in changes of LMT directive documentation in New Zealand.[21,22] This retrospective cohort study assessed timing of ACDs in relation to MET activation during hospitalisation along with timing of MET activation in relation to hospital admission and discharge or death in one tertiary New Zealand hospital. Characteristics and outcomes of patients with and without ACDs were also assessed.

Methods

Study design

A retrospective cohort design was used to evaluate the medical files of all patients who had an emergency call event (cardiac arrest or MET call) attended by the MET at Wellington Regional Hospital over a 12-month period.

Post-hoc analysis of the emergency call audit data collection process was performed.

Ethics approval

Ethics approval was obtained from the Central Regional Ethics Committee of the New Zealand Health and Disability Ethics Committees as a low-risk study; the need for informed consent was waived (reference no. CEN/10/EXP/46).

Setting, participants, and inclusion and exclusion criteria

Wellington Regional Hospital is a 450-bed tertiary referral hospital serving central New Zealand. The study included all hospital inpatients ⩾ 18 years who had an emergency call between 1 October 2009 and 30 September 2010. This coincided with the implementation of the hospital's MET system, which began in September 2009.

The MET, composed of an intensive care doctor and intensive care nurse, attended emergency calls. MET triggers were similar to those previously studied.[9] The MET interacted with the patient, patient's family (if present) and representatives of the patient's treating medical and nursing team after the emergency system was triggered. Cardiac arrest calls were designated for patients suffering cardiac or respiratory arrest. MET calls were triggered for physiological signs of clinical deterioration in patients not suffering cardiorespiratory arrest. The MET service was overseen by the intensive care department and resuscitation committee.

Paediatric patients (aged less than 18 years), outpatients, visitors and patients in the hospital's semidetached psychiatric ward were excluded from the study.

Case finding and data collection

All emergency calls were logged at Wellington Regional Hospital switchboard during the study period. Resuscitation committee policy required an emergency call audit document to be completed by a senior nurse for all emergency calls. Any completed audit document was then given to the hospital resuscitation committee representative for entry into the committee's emergency call database. Eligible patient files for this period were identified from this emergency call database (between September and December 2010) and examined. Patient files were reviewed by one of three clinicians and a standard data collection proforma was used to collate data.

Definition of variables

The primary outcome considered was the presence or absence of documentation of ACDs anywhere in the written record of the patient's current hospital admission. This was to reflect the written information available clinically to the team members at the time of a MET call.

At Wellington Regional Hospital, there are two components to ACDs: LMT directives, which may include limitation of any aspect of therapy; and not-for-resuscitation (NFR) directives, which specifically document a patient's resuscitation plan in the event of cardiorespiratory arrest.

Documentation of NFR status and LMT status were considered separately. Documentation of NFR status was considered to be present if there was a completed, time-stamped medical record entry and/or a completed hospital NFR form. This included any patients who were documented for full resuscitation. Documentation of an LMT directive was considered to be present if there was a time-stamped completed medical record entry. There were no preprinted forms specifically for documenting LMT status. If neither LMT nor NFR status were documented in the patient file during the active admission to the point of assessment, this was considered to be absence of documentation. Previous ACDs were not considered valid for the studied admission.

For NFR status, where specific forms existed, the location of documentation was also assessed (notes or form). Case-note documentation of LMT was coded as "unclear" if the documented plan was ambiguous or did not provide specific guidance. The seniority of the documenting clinician, the appropriateness of the LMT or NFR, and evidence of patient involvement were not assessed.

The presence of LMT and NFR documentation was recorded at four time intervals to assess the temporal association between MET activation and ACD completion: Period 1 (at hospital admission); Period 2 (between hospital admission and MET call); Period 3 (within 24 hours post-MET call, including patients whose therapy was limited during a MET call or cardiac arrest); Period 4 (from > 24 hours post-MET call until hospital discharge or death).

Patient demographics were collected, including age, sex and treating unit specialty. We prospectively proposed several variables that might be associated with increased advance care documentation: age of 75 years or above, previous documentation of an LMT directive, residence at an aged care facility, cardiac failure, localised cancer, metastatic cancer, domiciliary oxygen use, chronic renal failure, history of stroke, and dementia or cognitive impairment.

The following chronological features of the hospital stay were recorded: admission times, timing of MET event and hospital discharge.

Statistical analysis

Data were analysed using Stata SE, version 11.1 (StataCorp, College Station, Tex, USA). Categorical data are presented as numbers and percentages. Descriptive statistical methods were applied. χ^2 tests were used for associations of categorical data and for comparisons of proportions between groups. Non-normally distributed data are presented as median (interquartile range [IQR]). The Mann–Whitney *U* test was used to compare medians between

groups. Post-MET survival analysis was completed using the Kaplan–Meier method. $P < 0.05$ was considered statistically significant.

Results

Details of emergency calls during study period

A post-hoc investigation of audit data collection showed 254 emergency events were logged at the hospital switchboard for emergency calls. Of these, 127 events were reported on audit sheets to the resuscitation committee. Only 93 audit reports of the total 254 emergency events (37%) were able to be associated with patient clinical records. These 93 files were the initial data source for this study.

These 93 patient files were screened for a-priori exclusion criteria. Nineteen patients were excluded (Figure 1) and three files were unavailable during the study period for administrative reasons, leaving 71 patients included in the analyses. There were 32 181 adult hospital admission episodes during the study period (excluding psychiatric admissions). The audited emergency call rate was 2.3 per 1000 patient admissions (74/32 181). The cardiac arrest rate was higher (1.2 per 1000 patient admissions [39/32 181]) than the MET rate (1.1 per 1000 [34/32 181]). If all available switchboard emergency call data were used, the corrected MET rate was 2.2 per 1000 patient admissions (71/32 181) and the corrected emergency call rate was 1.7 per 1000 patient admissions (56/32 181).

Patient characteristics and details of advance care directives

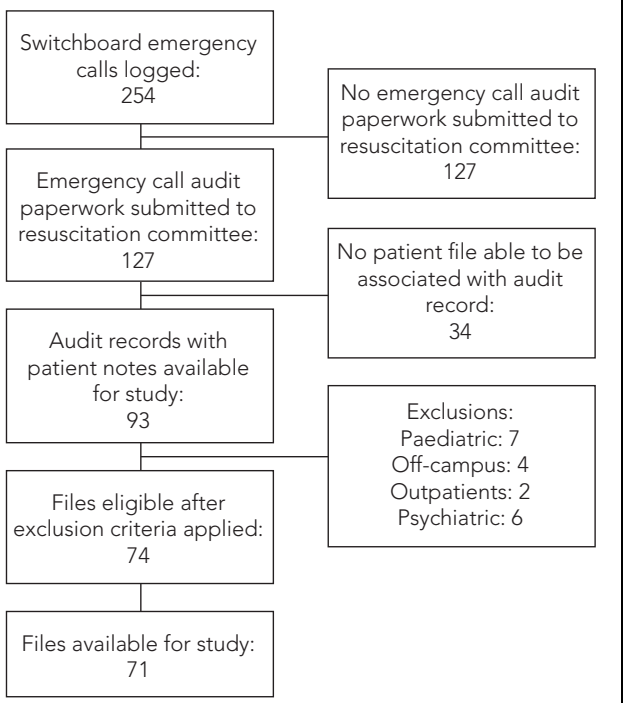
Patient characteristics for the hospitalisation are summarised in Table 1. The median age was 69 years (IQR, 58–80 years) for the study cohort. Most patients were women (43/71; 61%). Similar proportions of patients were admitted to medical and surgical units. ACD completion was similar for in-hours and out-of-hours admissions.

Timing of medical emergency team calls and documentation of advance care directives

Time to MET activation was numerically, but not statistically, different between patients with and without ACDs (Table 2). Time from MET to discharge was also not statistically different. Figure 2 shows the documentation rates of LMT at the four predefined different periods, and Figure 3 shows the comparable rates for NFR status.

The greatest increase in documentation rates for both LMT and NFR status occurred within 24 hours after an emergency call, representing a 111% and 91% relative increase, respectively. Increases in NFR and LMT documentation rates occurred in parallel across each period. There was a marked increase in the proportion of LMT plans that contained clear orders in the period immediately after MET review.

Figure 1. Screened eligible patients



Patient survival after emergency calls

Two patients were discharged alive and 18 patients died within 24 hours of emergency call. These patients were excluded from Period 4 (>24 hours after MET review) in Figure 2 and Figure 3.

Table 3 describes the relation of emergency call type with documentation and mortality. Cardiac arrest calls had a significantly higher mortality ($P < 0.01$) and a statistically non-significant earlier mortality than MET calls ($P > 0.05$).

Thirty-day post-MET survival was analysed by documentation subgroup with the Kaplan–Meier method (Figure 4). Patients with a documented ACD had significantly lower survival than patients without an ACD at 30 days; this is statistically significant at 1day post-MET review ($P < 0.05$). Three patients without ACDs survived between 33 and 370 days after MET review and are not included in Figure 4.

Associations with advance care directive documentation

We compared the proportion of patients with an ACD at different phases of the hospital admission, and analysed differences in age, comorbidity burden and inhospital mortality for each period (Table 4). In Period 2, the documentation rate was 18% (13/71). In this period, patients with ACDs completed inhospital had a similar hospital mortality

Table 1. Characteristics of included patients

Patient characteristic	No. (% total)	No. with no documentation (% of subgroup)	No. with any documentation in hospital (% of subgroup)	*P**
Total	71 (100%)	24 (34%)	47 (66%)	ns
Median age, years (interquartile range)	69 (58–80)	62 (48–72)	71 (61–81)	0.009†
Sex				ns
Female	43 (61%)	13 (30%)	30 (71%)	
Male	28 (39%)	11 (39%)	17 (61%)	
Treating unit				ns
Medical	40 (56%)	12 (50%)	28 (60%)	
Surgical	31 (44%)	12 (50%)	19 (40%)	
Admission time				ns
Out-of-hours (18:01–07:59 hours)	32 (45%)	12 (50%)	20 (43%)	
In-hours (08:00–18:00 hours)	39 (55%)	12 (50%)	27 (57%)	
Comorbidity				
Domiciliary oxygen	0	0	0	ns
Stroke	7 (10%)	1/24 (4%)	6/47 (13%)	ns
> 75 years	25 (35%)	4/24 (17%)	21/47 (45%)	0.02
Congestive cardiac failure	22 (31%)	4/24 (17%)	18/47 (38%)	0.04
Chronic renal failure	12 (17%)	3/24 (13%)	9/47 (19%)	ns
Aged-care facility resident	7 (10%)	1/24 (4%)	6/47 (13%)	ns
Dementia or cognitive impairment	12 (17%)	0	12/47 (26%)	0.01
Localised cancer	13 (18%)	1/24 (4%)	12/47 (26%)	0.03
Metastatic cancer	9 (13%)	0	9/47 (19%)	0.03
Previous limitation of medical therapy directive	7 (10%)	0	7/47 (15%)	0.05
Two or more comorbidities	33 (46%)	4/24 (17%)	29/47 (62%)	0.001
Hospital mortality	30 (42%)	1/24 (4%)	29/47 (62%)	0.001

* χ^2 test unless otherwise specified. † Mann–Whitney *U* test difference, $z = 2.61$. ns = not significant.

and were older than those without ACDs. There was a non-significant difference in comorbidity burden.

In Period 3, the group with ACDs became different. This group was older and had a higher inhospital mortality rate than those without ACDs ($P < 0.05$). There was a non-significant greater comorbidity burden in the ACD group.

In Period 4, documentation rates of ACDs remained relatively unchanged until discharge (in all patients and those surviving beyond 24 hours post-MET review), but comorbidity burden, mortality and age are statistically significantly higher in the ACD group.

Table 5 shows the differences between ACD documentation, mortality and comorbidity among patients discharged within 24 hours post-MET review and those discharged more than 24 hours post-MET. There was a trend in both subgroups for those with ACDs having a higher mortality and comorbidity burden than those without ACDs. This was statistically significant in those surviving more than 24 hours after MET review. The age distributions were similar.

Associations with advance care directive documentation

Documentation of ACDs was significantly associated with inhospital death, the presence of two or more prespecified comorbidities, dementia, age greater than 75 years and metastatic cancer (Table 6). Multiple logistic regression analysis confirmed presence of significant correlation of congestive cardiac failure, dementia, aged care facility residency, metastatic cancer, and previous LMT directive documentation with presence of inhospital documentation of ACDs.

Admitting team, older age, in-hours admission, in-hours emergency call or stroke status were not significantly associated with completed documentation status (not shown). No patients with domiciliary oxygen were seen by the MET service.

Discussion

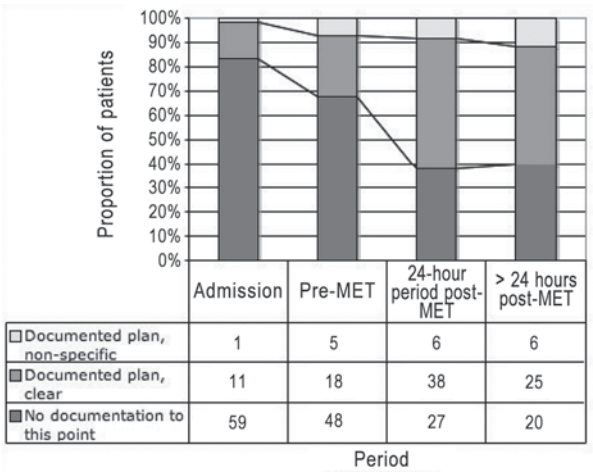
Our study demonstrates a markedly increased rate of documented ACDs (NFR and LMT directives) after MET

Table 2. Temporal and mortality differences between patients with and without ACDs

Document status	No. (% [95% CI])	Median time to MET review, days (IQR)	Median time from MET review to discharge, days (IQR)	Inhospital mortality, no. (% [95% CI])
No ACD	24/71 (34% [5.6%–22.5%])	3.3 (0.9–9.8)	5.9 (1.8–8.8)	1/24 (4% [0.1%–21.1%])
ACD present	47/71 (66% [54.9%–77.4%])	1.6 (0.6–4.5)	2.3 (0.2–11.1)	29/47 (62% [46.3–75.4%])
P		> 0.05*	> 0.05*	< 0.01†

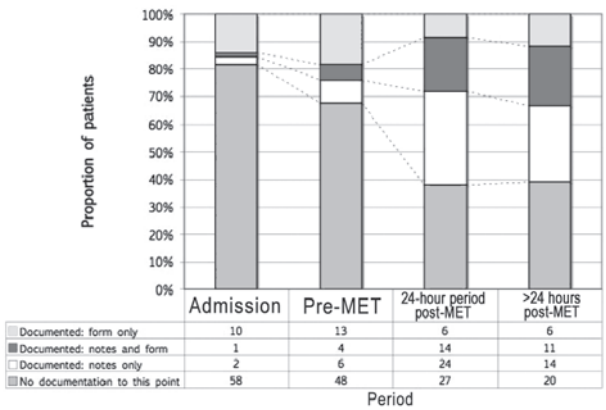
ACD = advance care directive. MET = medical emergency team. * Difference non-significant (Mann–Whitney *U* test). † χ^2 test for proportions.

Figure 2. Documentation of limitation of medical therapy directives: status changes by period*



MET = medical emergency team. * Period 4 (> 24 hours post-MET review) excludes 20 patients (2 discharged, 18 died).

Figure 3. Documentation of not-for-resuscitation directives: status changes by period*



MET = medical emergency team. * Period 4 (> 24 hours post-MET review) excludes 20 patients (2 discharged, 18 died).

review, which remains stable thereafter. The proportion of MET patients with an LMT directive was much higher than previous studies.[6,9,23-25] Patients with ACDs had a high mortality. There was low compliance with hospital policy of universal NFR form completion.

The number of patients with new and clear LMT plans more than doubled in the 24 hours after MET review. The 24 hours after MET review saw the greatest LMT and NFR status documentation rate across all periods, and was associated with high mortality. Documentation rates were low among survivors beyond 24 hours after MET activation. Inhospital ACD completion was associated with inhospital mortality, increasing age and high comorbidity burden, specifically with metastatic cancer, dementia, cardiac failure and previous LMT directives.

This is the first study to examine the association between MET review and LMT and NFR documentation sequentially during a course of hospitalisation in New Zealand. The temporal association of MET with ACD documentation was demonstrated, along with patient factors associated with completed ACD documentation.

Characteristics of patients who had their initial directives completed within 24 hours after MET review were similar to those who had pre-MET review directives in place. The significance of this difference increased for those surviving beyond 24 hours post-MET review. This may represent modification of therapeutic goals in response to an unexpected deterioration of a patient, or may suggest a later formalisation of LMT directives for older patients with a larger comorbidity burden.

Patients without documentation after MET involvement were younger, had fewer comorbidities and were more likely to survive hospitalisation than those with ACDs.

MET activation was not associated with a change in documentation rates among those who were ultimately to survive. Existing pre-MET review LMT directives were clarified after MET review. This possible causal link of a MET clarifying treatment plans without subsequent change of directives by treating units needs further investigation.

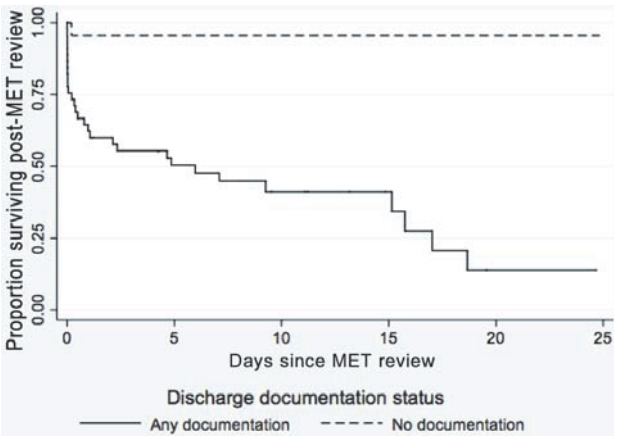
There was low compliance with the hospital policy of universal NFR documentation at admission. The specific NFR

Table 3. Emergency call type characteristics

	Emergency call type	
	MET	Cardiac arrest
No. (% of total)	32/71 (45%)	39/71 (55%)
No documentation of ACD before emergency call, no. (% [95% CI])	20/32 (63% [45.1%–79.8%])	28/39 (72% [57.2%–86.3%])
Inhospital death, no. (% [95% CI])	7/32 (22% [7.2%–36.2%])	23/39 (59% [43.5%–74.4%)
Median days to death after MET activation (interquartile range)	2.1 (0.8–6.0)	0.2 (0.02–4.9)

ACD = advance care directive. MET = medical emergency team.

Figure 4. Kaplan–Meier plot of survival after emergency calls by advance care directive documentation status ($P < 0.05$)



forms, designed for completion at hospital admission, were used less for any initial ACD documentation than for documentation later during the hospital admission.

Documentation of LMT or NFR status is significantly associated with death — 62% of these patients died during their hospital admission. Most of these deaths occurred within 24 hours of the emergency call. An increased risk of mortality among those with ACDs persisted throughout the admission. This may suggest either a late triggering of the MET system for patients in an unsalvageable condition, or accurate clinical identification of dying patients by the MET and focused redirection of care for these patients.

Patients with domiciliary oxygen-dependent lung disease did not feature in the audit. This may have been due to the respiratory unit policy of discussing and completing LMT directives for these patients in the outpatient setting (personal communication, Dr Kyle Perrin, respiratory physician, Wellington Regional Hospital).

There is a very low MET call rate in this hospital compared with previous studies[6,26] despite correction for a large

Table 4. Group characteristic comparisons by documentation status for each predefined hospitalisation period

Time period	Directive status	No. (%)	Median age, years (IQR)	Proportion with ⩾ 2 comorbidities (95% CI)	Mortality proportion (95% CI)
Period 1: admission	None	58 (82%)	65.5 (56–77)	0.45 (0.31–0.58)	0.41 (0.28–0.54)
	Any	13 (18%)	76 (66–81)	0.54 (0.22–0.85)	0.46 (0.14–0.77)
P for difference			< 0.05*	< 0.778†	< 0.997†
Period 2: pre-MET review	None	48 (68%)	62 (44–73)	0.42 (0.27–0.56)	0.33 (0.20–0.47)
	Any	23 (32%)	71 (61.5–81)	0.57 (0.34–0.78)	0.61 (0.45–0.91)
P for difference			< 0.02*	< 0.357†	< 0.028†
Period 3: < 24 hours post-MET review	None	27 (38%)	62 (56–81)	0.26 (0.08–0.44)	0.11 (0.00–0.23)
	Any	44 (62%)	70 (62–80)	0.59 (0.43–0.77)	0.61 (0.33–0.76)
P for difference			< 0.019*	< 0.013†	< 0.001†
Period 4: hospitalisation	None	24 (34%)	62 (48–71.5)	0.17 (0.01–0.33)	0.04 (0.00–0.13)
	Any	47 (66%)	69 (58–80)	0.62 (0.47–0.76)	0.62 (0.46–0.74)
P for difference			< 0.014*	< 0.001†	< 0.001†

IQR = interquartile range. MET = medical emergency team. * Mann–Whitney *U* test of significant difference. † χ^2 test for proportions.

Table 5. Group characteristic comparisons by documentation status for post-MET review period subgroups

Patient group	Directive status	No. (%)	Median age, years (IQR)	Proportion with ⩾ 2 comorbidities (95% CI)	Mortality proportion (95% CI)
Discharged ⩽ 24 hours after MET review ($n = 20$)	None	3 (15%)	63 (36–90)	0	0.33 (0–1.0)
	Any	17 (85%)	70.5 (62–80)	0.59 (0.33–0.85)	1.0
P for difference			< 0.56*	0.210	0.012
Discharged > 24 hours after MET review ($n = 51$)	None	21 (41%)	66 (55–77)	0.19 (0.01–0.39)	0
	Any	30 (59%)	68 (61.5–80.5)	0.63 (0.43–0.79)	0.40 (0.20–0.57)
P for difference			< 0.03*	0.004	0.003†

* Mann–Whitney *U* test, significance of difference of ages within subgroup. † χ^2 test for proportions.

Table 6. Patient characteristics associated with any completed documentation

Characteristic	χ^2 for association	*P*
Significant strong associations with documentation		
Death	25.55	< 0.001
⩾ 2 comorbidities	25.42	< 0.001
Dementia	7.37	0.007
Age > 75 years	5.46	0.02
Metastatic cancer	5.26	0.02
Significant weak associations with documentation		
Cardiac failure	3.47	0.04
Cancer	4.84	0.03
Previous limitation of medical therapy directive	3.96	0.046

amount of data loss on post-hoc analysis. This may be due to the MET system being newly introduced, underpromoted and without a mandatory activation requirement. Our study has the inherent biases of a small, retrospective, uncontrolled cohort study. Large numbers of missing data, detected after the completion of the study, further limit the conclusions of our study. Interpretation bias was only partially reduced by independent clinicians encoding information on data forms created a priori.

Underreporting of MET events is high because of clinical record unavailability and administrative and auditing errors.

Assessment of patient physiological status, severity of illness, MET triggers, intensive care stay and emergency admission status were not analysed in this study and may have interacted with the ACD documentation rate. The study did not investigate the appropriateness of, or medical adherence to, these directives.

Assumptions about information available to the MET service in real time about patient characteristics and directives may have been overreported due to a thorough retrospective examination of the clinical notes. The study design could not assess undocumented communication and human factors in the crisis decision-making process. Random sampling of files from patients not seen by a MET and comparing them to those of our cohort would improve the generalisability of this hospital's practice.

Conclusions

Our study provides an insight into hospital documentation and audit culture relating to MET events in a New Zealand tertiary hospital. It provides insight into areas where hospital policy may not be reflected in practice. LMT and NFR directive rates increased during and significantly after MET involvement. Patients without directives were different to those with completed directives. Compliance with the universal resuscitation status policy was low despite MET involvement. There was strong association between directives and death, suggesting an opt-out resuscitation culture. Emergency call audit data completion was very low. Emergency call audit system deficiencies were revealed on post-hoc investigation.

Documentation systems for LMT directives and resuscitation systems audit are tools for medical practice. Further investigation is needed into the interaction between hospital systems, medical culture, human factors and patient-centred clinical decision making.[27]

Competing interests

None declared.

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