

APPENDICES

E1. Study locations

Behavioural mapping was performed in both the intensive care unit (ICU) and ventilator weaning unit (VWU) of the study hospital.

Intensive care unit

The adult ICU is a 30 bedded unit, split over two levels with fifteen beds on each floor. It receives a case mix of both general medical and surgical patients, and is also a tertiary referral centre for management of severe respiratory failure and delivery of advanced respiratory support including extracorporeal membrane oxygenation (ECMO). Nurse to patient ratio for general ICU patients is 1:1, and 2:1 for patients requiring ECMO. The daily medical team comprises 2 intensive care consultants, 2 specialist registrars and 2 junior doctors on each floor. There are 9.5 whole time equivalent (WTE) qualified and 1.5 WTE assistant physiotherapy staff who provide a 7-day/week service from 8.00am-8.00pm each day, including a Clinical Specialist (Agenda for Change, Band 8a, Master of Science qualification) who leads the team. The physiotherapy staffing profile is in line with national guidance (1 WTE per 4 beds, with a senior clinician with notable postgraduate experience and/or qualification) ¹. Physiotherapy staff operate autonomously providing service to the whole ICU and are responsible for review and delivery of both respiratory and physical therapy management. Other therapy staff e.g. occupational therapy are available on referral basis only. There is no designated rest period on the ICU during the day.

Ventilator weaning unit

This a 14 bedded tertiary referral weaning unit for neuromuscular and post-ICU patients. There are approximately 4 to 5 post-ICU patients admitted per month. Nurse to patient ratio is 1:2 akin to high dependency level care. The daily medical team comprises 1 consultant, 1 specialist registrar and 1 junior doctor. 5.3WTE qualified physiotherapy staff operate the same service delivery as per the ICU, and there is also 1.0WTE occupational therapist for the unit. Designated rest periods are between 12.00pm-1.00pm and 5.00-6.00pm.

E2. Behavioral mapping procedure

Mapping days were conducted between Monday and Sunday by a single observer (JM) provided at least 3 patients were eligible for observation on the ICU and at least 2 on the VWU, with a maximum of 6 patients. For pragmatic purposes, only one floor of the ICU was observed on any occasion. The time period for observation, 8.30am-8.00pm, represents a complete daily nursing and physiotherapy shift for either unit (excluding an initial 30minute handover period at 8.00am). Patients were observed for 1 minute out of every 10 minutes throughout the day except for six randomly scheduled 10-minute observer breaks.

During each observation, the observer recorded three data points; the location of the patient, people in attendance, and the highest level of activity. The route through either unit remained the same throughout the day. If the curtains were closed around a bedspace, or the patient was off the unit, data points for people present and patient location were recorded as 'not observed' as this could not be confirmed. To minimise the effects of observing practice on standard care, treating staff on the ICU were informed that the study aimed to assess patient activity on the ICU or VFU and record usual care practices.

Patient location and people in attendance

Patient location was categorised as in bed, in the bed space, out of the bed space or off the unit. People in attendance were classified into categories of: alone, nursing staff, medical staff, physiotherapist, other Allied Health Professionals (AHP), family/visitors, or Other e.g. domestic staff or chaplaincy. To be classified as *in attendance*, individuals were required to be actively interacting with the patient. 'Active interaction' was defined as any action involving direct communication, engagement or exchange with a patient in a therapeutic rehabilitative context ^{2, 3, 4}. Multiple categories of people in attendance were recorded where applicable if present.

Activity level classification

The highest level of activity was classified using an adapted version of the internationally standardised ICU Mobility Scale ¹ (IMS) and these activities were further grouped into intensity levels ² (Table 1, main manuscript). The expanded IMS content included two additional levels identified during the pilot phase of the study - Level 0a (purposeful upper limb movement) and Level 3a (seated position in chair).

E3. Activity profile of intensive care unit patients

Table E1 presents behavioural mapping data for ICU patients according to length of stay.

Table E1. Behavioural mapping data for ICU patients according to length of stay

	<72 hours (n=4)^a %	72 hours to 7 days (n=15) %	>7 days (n=23) %
LOCATION			
In the bed	100	100 (100-100)	100 (87-100)
In the bed space	0	0	0 (0-0)
Out of bed space	0	0	0
Off Ward	0	0 (0-0)	0 (0-0)
ACTIVITY LEVEL			
No/Minimal activity	99	98 (92-100)	100 (84-100)
Low Intensity	0	0	0 (0-0)
Moderate Intensity	0	0	0 (0-0)
High Intensity	0	0	0
Not observed	1	0 (0-8)	0 (0-3)

PEOPLE IN ATTENDANCE

Alone	91	63 (44-79)	63 (40-76)
Nursing Staff	5	13 (10-25)	16 (10-38)
Medical Staff	1	2 (0-3)	2 (0-3)
Physiotherapist	0	2 (0-3)	5 (0-6)
AHP	0	0 (0-0)	0 (0-0)
Family/Visitors	2	8 (0-25)	2 (0-32)
Other	0	0	0 (0-0)
Not observed	1	0 (0-8)	0 (0-3)

Data are expressed as median (IQR) percentage of aggregate percentages of observations. Where no range is indicated, no observations were made in this category and there were no data to report. ^a Too few values to generate median and interquartile range therefore absolute percentages recorded

Abbreviations: AHP = Allied Health Professional

E4. Physical therapy sessions delivered to ICU patients on the day of observation

Forty-one patients were reviewed by a physiotherapist on one or more occasions throughout their observation day. Of these patients, 22 received respiratory physiotherapy which included techniques for airway clearance, positioning to optimise ventilation and also pre- and post-extubation reviews; 9 patients were reviewed and assessed and either had advice provided to nursing staff, where appropriate, or the treating physiotherapist deemed direct physiotherapy treatment not to be indicated; and 10 received exercise therapy including functional activities categorised on the IMS ²⁵. Of the 10

patients who engaged in exercise therapy, 4 were mechanically ventilated and six patients were non-mechanically ventilated (Table E2). One patient was in receipt of inotropic support (0.1µg/min) and renal hemofiltration. A second patient was in receipt of renal hemofiltration alone. Patients who received exercise therapy on their observation day had lower illness acuity (SOFA score, 8.0 (2.1) vs. 11.3 (4.0), $p=0.02$) and improved sedation score (RASS, -0.5 (-2.0 – 0.0) vs. -3.0 (-4.0 - -1.3), $p=0.0006$). The patient that stood during exercise therapy was mechanically ventilated via a tracheostomy and had been on the ICU for 90 days at the time of observation. The highest activity recorded across all patients, transferring bed to chair, was achieved by a patient who no longer required mechanical ventilation and was self-ventilating via their own airway.

Table E2. Detail of ICU patients and activity achieved during exercise therapy on day of observation

Patient	SOFA	Vent- ilation status	Airway	RASS	Activity	IMS Level
1	10	MV	TT	0	Standing	4
2	7	MV	TT	-2	Sat over edge of bed	3

3	10	MV	ETT	-2	Exercise in bed	1
4	5	MV	TT	0	Sat over edge of bed	3
5	7	Non-MV	ETT	-2	Sat over edge of bed	3
6	6	Non-MV	ETT	0	Sat over edge of bed	3
7	8	Non-MV	Own	0	Transfer bed to chair	5
8	7	Non-MV	Own	0	Standing	4
9	12	Non-MV	Own	-1	Sat over edge of bed	3
10	8	Non-MV	Own	-1	Sat over edge of bed	3

RASS = (-5) Unroutable; (-4) Deep sedation; (-3) Moderate sedation; (-2) Light sedation; (-1) Drowsy; (0) Alert and Calm; (+1) Restless; (+2) Agitated; (+3) Very agitated; (+4) Combative

Abbreviations: SOFA = Sequential Organ Failure Assessment (SOFA) score; MV = Mechanically Ventilated; Non-MV = Non-mechanically ventilated; ETT = Endotracheal Tube; TT = tracheostomy tube; RASS = Richmond Agitation and Sedation Score; IMS = Intensive Care Unit Mobility Scale

E5. Physical therapy sessions delivered to VWU patients on the day of observation

All patients were reviewed by a physiotherapist on one or more occasions throughout their observation day. Of these, 1 received respiratory physiotherapy which included techniques for airway clearance; 1 had an initial baseline assessment, and 9 received exercise therapy including functional activities categorised on the IMS ²⁵. Of the 9 patients who engaged in exercise therapy, three were mechanically ventilated and six patients were non-mechanically ventilated (Table E3).

Table E3. Detail of ventilator weaning unit patients and activity achieved during exercise therapy on day of observation

Patient	Ventilation	Airway	Activity	Level
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No.	Status			IMS
1	Non-MV	TT	Respiratory review – suction only	0
2	Non-MV	Own	Standing	4
3	MV	TT	Transferred bed to chair	5
4	MV	TT	Mobilised >200m with frame and supervision	9
5	Non-MV	TT	Standing	4
6	Non-MV	TT	Transferred bed to chair	5
7	Non-MV	TT	Transferred bed to chair	5
8	Non-MV	Own	Mobilised 80m	9
9	Non-MV	TT	Baseline assessment	0
10	MV	TT	Treatment commenced but	0
11	MV	TT	Sat over the edge of the bed ceased due to desaturation	3

Abbreviations: MV = Mechanically Ventilated; Non-MV = Non-mechanically ventilated; IMS = Intensive Care Unit Mobility Scale