Early Mobilization of Mechanically Ventilated Patients: A 1-Day Point-Prevalence Study in Germany*

Peter Nydahl, RN, BScN[1]; A. Parker Ruhl, MD[2,3]; Gabriele Bartoszek, MSc[4]; Rolf Dubb, BSc, CCRN[5]; Silke Filipovic, BSc[6]; Hans-Jürgen Flohr, RN, CCRN[7]; Arnold Kaltwasser, BSc, CCRN[8]; Hendrik Mende, MD[9]; Oliver Rothaug, BSc, CCRN[10]; Danny Schuchhardt, RN[11]; Norbert Schwabbauer[12]; Dale M. Needham, FCA, MD, PhD[2,13]

*See also p. 1308.

[1]Nursing Research, Nursing and Patient Service, University Hospital of Schleswig-Holstein, Campus Kiel, Germany.

[2]Outcomes After Critical Illness and Surgery (OACIS) Group, Division of Pulmonary and Critical Care Medicine, Johns Hopkins University, Baltimore, MD.

[3]Critical Care Medicine Department, National Institutes of Health, Clinical Center, Bethesda, MD.

[4]Faculty of Nursing Science, University of Witten-Herdecke, Witten, Germany.

[5]Department of Anaesthesiology and Operative Intensive Care Medicine, Katharinenhospital, Klinikum Stuttgart, Stuttgart, Germany.

[6]Department of Physiotherapy, University Hospital of Gießen and Marburg GmbH, Marburg, Germany.

[7]Work and Life Educational Association, Göttingen, Germany.

[8]Department of Continuing Education of Critical Care Nursing, District Hospital of Reutlingen, Reutlingen, Germany.

[9]Department of Anaesthesiology and Intensive Care Medicine, Alb Fils Kliniken GmbH, Klinik am Eichert, Göppingen, Germany.

[10]Department of Anaesthesiology, Emergency and Intensive Care Medicine, University Hospital of Göttingen, Göttingen, Germany.

[11]Department of Anaesthesia and Intensive Care Medicine, Zentralklinik Bad Berka, Bad Berka, Germany.

[12]Department of Medicine, University Hospital Tübingen, Tübingen, Germany.

[13]Department of Physical Medicine and Rehabilitation, Johns Hopkins University, Baltimore, MD.

Mr. Nydahl lectured for Hill-Rom and received support for article research from The German Interdisciplinary Association of Critical Care Medicine, which had no role in designing and conducting the study, data collection, management, analysis, and interpretation of the data; or the preparation, review, or approval of the article. Mr. Kaltwasser consulted for Kimberly-Clark Health Care (KCC) and Hollister; lectured for Hollister, KCC, and Smith Medical; received support for article preparation from Hollister; and received support for article research from German Interdisciplinary Association of Critical Care Medicine Mr. Schuchhardt lectured for and received support for the development of educational presentations from the company providing material for management of chronic wounds. Dr. Needham's institution received grant support (National Institutes of Health peer-reviewed grants). The remaining authors have disclosed that they do not have any potential conflicts of interest.

For information regarding this article, E-mail: peter.nydahl@uksh.de

DOI: 10.1097/CCM.0000000000000149

Objectives: There is growing evidence to support early mobilization of adult mechanically ventilated patients in ICUs. However, there is little knowledge regarding early mobilization in routine ICU practice. Hence, the interdisciplinary German ICU Network for Early Mobilization undertook a 1-day point-prevalence survey across Germany.

Design: One-day point-prevalence study.

Setting: One hundred sixteen ICUs in Germany in 2011.

Patients: All adult mechanically ventilated patients.

Interventions: None.

Measurements and Main Results: For a 24-hour period, data were abstracted on hospital and ICU characteristics, the level of patient mobilization and associated barriers, and complications occurring during mobilization. One hundred sixteen participating ICUs provided data for 783 patients. Overall, 185 patients (24%) were mobilized out of bed (i.e., sitting on the edge of the bed or higher level of mobilization). Among patients with an endotracheal tube, tracheostomy, and noninvasive ventilation, 8%, 39%, and 53% were mobilized out of bed, respectively ($p < 0.001$ for difference between three groups). The most common perceived barriers to mobilizing patients out of bed were cardiovascular instability (17%) and deep sedation (15%). Mobilization out of bed versus remaining in bed was not associated with a higher frequency of complications, with no falls or extubations occurring in those mobilized out of bed.

Conclusions: In this 1-day point-prevalence study conducted across Germany, only 24% of all mechanically ventilated patients and only 8% of patients with an endotracheal tube were mobilized out of bed as part of routine care. Addressing modifiable barriers for mobilization, such as deep sedation, will be important to increase mobilization in German ICUs. (*Crit Care Med* 2014; 42:1178–1186)

Key Words: early mobilization; intensive care units; mechanical ventilation; physical therapists; prevalence; surveys

There is growing evidence supporting the safety, feasibility, and benefits of early mobilization of mechanically ventilated patients in the ICU (1–4). Benefits of early mobilization include improved physical function, reduced delirium, and reduced duration of mechanical ventilation and length of stay (5–9). Several surveys of self-reported practice in the area of ICU rehabilitation therapy have been published (10–15). However, there is little multisite research evaluating mobilization actually provided to mechanically ventilated patients as part of routine clinical practice (16). Hence, our objective was to undertake a 1-day point-prevalence study of mobilization of mechanically ventilated patients in ICUs across Germany, including evaluating associations with perceived barriers to mobilization and complications during mobilization.

METHODS

This study was conducted by the interdisciplinary German Network for Early Mobilization, consisting of nurses, physicians, physiotherapists (PTs), respiratory therapists (RTs), and occupational therapists (OTs). The study was registered in the German Register for Clinical Trials (DRKS00003254) and approved by the Ethics Committee of Christian-Albrechts-University, Kiel, Germany (D 461/11).

Study Sample

To be eligible to participate, each ICU must be located within an acute care hospital in Germany and provide care for mechanically ventilated adults. Rehabilitation centers were excluded. Study sites were recruited via a call for participation published in 11 German and European journals for nurses, physicians, and PTs; direct contact with experts in the field; and e-mail lists from existing German networks and organizations (e.g., German Society of Specialized Nursing, German Interdisciplinary Association of Critical Care Medicine). Interested clinicians replied via e-mail to the first author and were asked to confirm their interest in participation after reviewing a description of the study.

Design of Web-Based Survey

A list of potential items for the point-prevalence survey was generated based on a published systematic review of the literature (17) and on consultation with experts in the field. Redundant items were combined to reduce the number of items. Thereafter, the relevance of all remaining items was discussed by a multidisciplinary team of physicians, nurses, and PTs, with deletion of less relevant items. A draft version of the survey was then reviewed for clarity by four members of the German Network for Early Mobilization, with further refinement of item wording. A web-based version was then generated, pretested, and further refined by nine Network members, including physicians, nurses, and PTs. A web-based test version of the survey was uploaded to the study website (http://www.mobilization-day.org) with testing of its web-based functionality by 11 nurses and PTs.

Survey Content–Patient Characteristics

All mechanically ventilated patients 18 years old or older and currently admitted to a participating ICU were included in the study. No patient-level identifying information was collected. Data collection included 1) airway type endotracheal tube (ETT), tracheostomy, and noninvasive ventilation (NIV), 2) highest level of mobilization achieved (as described below) while receiving mechanical ventilation, 3) most important barrier to mobilizing patient to a higher level (as perceived by the participating clinician), and 4) most important complication (if any) occurring during mobilization (as perceived by the participating clinician). The survey provided a nonhierarchical list of potential response options for questions, with a text-based "other" option.

To record the highest level of mobilization achieved during the 24-hour study period, the following ordinal scale was used: 1) no mobilization, 2) turning in bed, 3) sitting in bed with the head of bed elevated, 4) sitting on the edge of the bed with feet on floor, 5) sitting out of bed in a chair, 6) standing out of bed, 7) marching in place, and 8) walking. This mobilization scale was used since it arose from an expert consensus process that occurred at the Fifth International Meeting of Physical Medicine & Rehabilitation in the Critically Ill (San Francisco) and because it permitted comparability with ongoing evaluations in other countries (18) (ClinicalTrials.gov NCT01927510, NCT01674608).

Survey Content–Hospital and ICU Characteristics

Hospital and ICU characteristics included 1) hospital type (university, university-affiliated, community, and other); 2) ICU type (medical-surgical, surgical, medical, cardiac surgical, neurological, transplantation, neurosurgical, and burn); 3) number of ICU beds available for all patients and specifically for mechanically ventilated patients; 4) ratio of ICU staff members (nurses, physicians, PT, RT, and OT) to patients; 5) timing of planning mobilization (morning rounds, multidisciplinary case discussion, immediately prior to mobilization); 6) clinician ordering mobilization (physician, nurse, PT, other clinician, order not required); 7) staff involved in mobilization (nurse, PT, physician, and other); 8) presence of selected ICU clinical protocols (standardized sedation, pain, and delirium assessment; daily interruption of sedation infusions; synchronized daily wake-up and spontaneous breathing trial; ventilator weaning; and early mobilization); and 9) types of mobility equipment available within the ICU (special bed, special chair, lifting device, walker, sliding board, tilt table, standing frame, and portable ventilator).

Survey Distribution

September 26–30, 2011, was selected for the study. Participating clinicians were sent two reminders (1 mo and 1 wk prior) regarding the upcoming survey. On Sunday, September 25, 2011, a clinician not involved with the study randomly chose which week day the study would take place by selecting one of five sealed opaque envelopes. Weekend days were excluded from selection due to reduced staff and anticipated lower

mobilization activity (19). For the purposes of data collection, the survey's timeframe was the 24-hour period of the selected study day. Participants received e-mail notification by 7:00 AM on the day after the selected study day with a request to perform data collection from medical records for the immediately preceding day. Participants had 3 days to complete data collection and web-based data entry, with access to a 24-hour/day telephone hotline to immediately answer any questions. To assist with standardization and comparability of data collection across participating ICUs, a standardized data collection form was used and a written protocol for chart abstraction, including a detailed description of the data elements to be collected, was provided to all participants. To ensure no web-based responses from uninvited participants, all e-mail addresses from respondents were compared with a list of confirmed participants. To incentivize participation, two prizes (an iPod touch and a 100 Euro book voucher) were offered to participants based on a random drawing.

Statistical Analysis

Standard descriptive statistics are reported, with Fisher exact and chi-square tests used to evaluate statistical associations. Based on review of the actual distribution of data from the study cohort for the 8-level mobilization scale, the scale was evaluated as a binary variable, consisting of "remained in bed" (level 1–3) or "mobilized out of bed" (level 4–8). Statistical significance was defined as a two-sided p value less than 0.05. Statistical analyses were completed using R statistical software (version 2.15.2, R Foundation for Statistical Computing, Vienna, Austria, http://www.r-project.org).

RESULTS

The point-prevalence survey was randomly selected to occur on Wednesday, September 28, 2011. Surveys were completed for 116 ICUs, by 105 unique clinicians (eight clinicians collected for two ICUs and one clinician for five ICUs within the same hospital), with 95% of all potential data points collected for 783 patients (**Table 1**). There was a median (interquartile range) of six (4–8) patients enrolled per participating ICU. The clinical disciplines of the participating clinicians were as follows: 61% nurse ($n = 71$), 28% PT ($n = 32$), 8% physicians ($n = 9$), and 2% other ($n = 3$).

ICU and Hospital Characteristics

University hospitals ($n = 54$; 47%) and medical-surgical ICUs ($n = 38$; 32%) were the most common hospital and ICU types represented. The most common mobilization practices reported among the 116 participating ICUs included planning mobilization during morning rounds (73%, $n = 87$), with physicians being the most common clinician ordering mobilization (84%, $n = 98$). Clinical protocols commonly used (**Table 2**) included standardized sedation and pain evaluations (75%, $n = 85$) and an early mobilization protocol (71%, $n = 81$).

Mobilization Data

Mobilization out of bed, as previously defined, occurred in 24% ($n = 185$) of all patients, with 55% having no mobilization greater than turning in bed and only 4% standing, marching, or walking on the day of survey. The distribution of airway types used for ventilation was ETT ($n = 408$; 52%), tracheostomy ($n = 309$; 40%), and NIV ($n = 66$; 8%), with the proportion of patients mobilized out of bed differing significantly by airway type: 8% ETT, 39% tracheostomy, and 53% NIV ($p < 0.001$) (**Table 3**). Only 1 of 401 patients with an ETT was reported to stand, march, or walk on the day of survey.

Mobilization out of bed did not differ by ICU type (comparing medical, surgical, cardiac surgical, and other ICUs; $p = 0.225$). However, a greater proportion of patients were mobilized out of bed in community and other hospitals versus university and university-affiliated hospitals (33% vs 23%; $p = 0.038$), with community and other hospitals also reporting a higher frequency of complications (30% vs 19%; $p = 0.044$). To assist with patient mobilization, among the 116 ICUs surveyed, 90% reported having special chairs, 81% sliding boards, 72% special beds, 70% walkers, 44% lifting devices, 30% tilt tables, 29% portable ventilators, and 9% standing frames. The proportion of patients mobilized out of bed was greater in ICUs reporting use of lifting devices (28% vs 20%; $p = 0.008$), walkers (25% vs 18%; $p = 0.045$), standing frames (36% vs 22%; $p = 0.008$), and portable ventilators (30% vs 20%; $p = 0.004$). For ICUs reporting availability of special beds, mobilized out of bed was lower (21% vs 32%; $p = 0.015$).

Perceived Barriers to Mobilization

For patients with data reported ($n = 762$), the most common perceived barriers to advancing mobilization (**Table 4**) were cardiovascular instability (14%, $n = 105$), deep sedation (11%, $n = 87$), and medical contraindication (defined in the survey as "open abdomen, increased intracranial pressure, unstable fractures, etc.," 11%, $n = 84$). A significantly greater proportion of patients mobilized in bed versus out of bed had any perceived barrier to advancing to a higher level of mobilization (84% [$n = 496$] vs 45% [$n = 79$]; $p < 0.001$), with the following specific perceived barriers being significantly more common ($p < 0.001$) in patients remaining in bed: cardiovascular instability, deep sedation, medical contraindication, and weakness. By contrast, weakness was a significantly more common barrier in those who were mobilized out of bed versus remaining in bed (Table 4). Deep sedation was more commonly reported as a barrier for mechanically ventilated patients with ETT versus tracheostomy versus NIV (17% vs 6% vs 0%; $p < 0.001$).

Complications

Participants reported complications during mobilization (**Table 5**) for 135 of 654 patients (21%) who had any level of mobilization, with the most common complications being pulmonary (ventilator dyssynchrony [4%] and oxygen saturation < 85% [3%]) and cardiovascular (mean arterial pressure < 55 mm Hg [2%] or > 140 mm Hg [1%] or arrhythmia [2%]). There was one removal of an ETT (0.2%) and four cardiac arrests (1%), with all of these complications reported in patients mobilized in bed (i.e., with rolling or sitting in bed with head of bed partially elevated). There was no removal of any intravascular catheter in any patient. The frequency of any

TABLE 1. Characteristics of Participating ICUs ($n = 116$)

Characteristic	n (%)[a]	Total Patients Enrolled, n (%)	No. of Patients Included in Study, Median (IQR)
Type of hospital[b]			
University	54 (47)	442 (56)	7 (5–10)
University-affiliated[c]	40 (34)	243 (31)	5 (2–8)
Community	21 (18)	92 (12)	5 (3–6)
Type of ICU[d]			
Medical-surgical	38 (32)	275 (39)	5 (2–9)
Surgical	25 (21)	153 (21)	6 (3–8)
Medical	16 (15)	86 (12)	5 (3–7)
Cardiac surgical	14 (12)	126 (18)	8 (4–11)
Neurological	6 (5)	34 (5)	6 (4–7)
Transplantation	3 (3)	10 (1)	—[e]
Neurosurgical	2 (2)	7 (1)	—[e]
Burn	1 (1)	21 (3)	—[e]
Number of ICU beds, mean (SD)			
ICU beds	15.4 (9.1)		
ICU beds available for mechanical ventilation	12.7 (8.3)		
Staffing ratio, mean (SD)			
Nurse to patient	2.4 (0.5)		
Physician to patient	6.8 (2.4)		
Physiotherapist to patient[f]	9.7 (5.1)		
Respiratory therapist to patient[f]	10.7 (5.9)		
Occupational therapist to patient[f]	13.7 (6.1)		
Type of clinician completing survey[g]			
Nurse	71 (61)		
Physiotherapist	32 (28)		
Physician	9 (8)		
Other	3 (2)		

IQR = interquartile range.
[a]Proportions may not add to 100% due to rounding.
[b]Data on hospital type not reported for six patients (0.5%) from one ICU (0.8%).
[c]University-affiliated hospitals have an association with universities but are not operated by a university.
[d]Data on ICU type not reported for 71 patients (9.1%) from 11 ICUs (9%).
[e]Median and IQR not calculated due to small sample size.
[f]Physiotherapists, occupational therapists, and respiratory therapists work at least part time in 116 (100%), 20 (17%), and 11 (9%) of participating ICUs.
[g]Data on type of clinician completing survey not reported for one participant (1%).

complication for patients mobilized in bed versus out of bed was 20% ($n = 94$) versus 23% ($n = 41$; $p = 0.450$), with no significant differences for any specific types of complications.

DISCUSSION

This report is the first German 1-day point-prevalence study on early mobilization of mechanically ventilated patients, including 116 ICUs and 783 patients. Overall, only 24% of patients were mobilized out of bed during the 24-hour study period, with 55% having a mobilization level no greater than turning in bed and only 4% standing, marching, or walking. Mobilization out of bed was significantly less frequent in patients with an ETT, with only 1 of 401 intubated patients (0.2%) standing, marching, or walking. Perceived barriers to advancing mobilization were reported more frequently in

TABLE 2. Mobilization Practices and Clinical Protocols of Participating ICUs

Mobilization Practice[a]	ICUs With Practices (n = 116) (%)
Timing of planning mobilization	
Morning rounds	87 (73)
Multidisciplinary case discussion	57 (50)
Immediately prior to mobilization	78 (69)
Type of clinician ordering patient mobilization	
Physician	98 (84)
Nurse	65 (56)
Physiotherapist	31 (27)
Other	3 (3)
Order not required	18 (15)
Staff involved in patient mobilization	
Nurse	112 (97)
Physiotherapist	106 (92)
Physician	11 (10)
Other	8 (7)
Clinical protocols	
Standardized sedation and pain evaluations	85 (75)
Early mobilization	81 (71)
Ventilator weaning	65 (57)
Synchronized daily wake-up and spontaneous breathing trial	55 (49)
Daily interruption of sedation infusions	46 (41)
Standardized evaluations for delirium	32 (28)

[a]More than one response could be provided for each survey question; hence, proportions add to more than 100%.

patients mobilized in bed versus out of bed. Complication rates were similar between both groups, with rare, but serious, complications (ETT removal and cardiac arrest) occurring during in-bed mobilization.

In this study, perceived barriers to achieving a higher level of mobilization were reported for 75% of all patients despite 71% of respondents citing the presence of a protocol for early mobilization. Pohlman et al (20) reported that in 89% of all rehabilitation sessions for mechanically ventilated patients at least one potential barrier for mobilization existed, such as acute lung injury, vasopressors, delirium, renal placement therapy, or obesity, but that patients in this randomized trial were nevertheless able to undergo early rehabilitation interventions by PT and OT. Talley et al (21) reported that 109 patients undergoing continuous renal placement therapy, another perceived barrier in this study, were able to participate in early mobilization without adverse effects. The significantly lower frequency of mobilization of patients with an ETT (vs tracheostomy or NIV) in this study may be explained, in part, by more frequent use of deep sedation in these patients. As previously reported, greater sedation, greater physiological instability, and shorter duration of ventilation or ICU stay are possible factors affecting the rate of mobilization of patients with an ETT (22).

In general, ICU culture and prioritization of early mobilization are important for addressing perceived barriers (16, 23–25). Leditschke et al (25) found preventable barriers in 47% of 151 patient days. Several barriers described in our survey, such as deep sedation, may be preventable using approaches described in prior research (26–28). Specifically, in this survey, 25% of participants noted their ICU did not monitor sedation or pain via protocol, and 72% did not monitor delirium via protocol. These are areas for quality improvement that may reduce related barriers to early mobilization (26–28). In addition, training ICU clinicians using current evidence regarding patient screening and safety issues regarding ICU mobilization may also reduce perceived barriers (1, 9, 26, 29–35).

Complications during mobilization were common, being reported in 21% of all patients, with no significant differences for mobilization in bed versus out of bed. A large number of these complications were likely to resolve without sequelae after a temporary cessation of mobilization, such as ventilator dyssynchrony, desaturation, and blood pressure changes. In this study, no patient mobilized out of bed experienced removal of an ETT or intravascular catheter, or had a fall. The rare, but serious, complications (ETT removal and cardiac arrest) occurred with mobilization in bed. Given that this study did not collect patient-level data on clinical acuity, it is unknown whether patients who were mobilized in bed were sicker than those mobilized out of bed.

The overall frequency of reported complications (21%) is higher than reported in previous studies. Bailey et al (1) enrolled consecutive mechanically ventilated patients in a single respiratory care ICU over 6 months and reported adverse events in less than 1% of activity events. Other ICUs have reported rates of 1–4% (2, 5–7, 16, 25, 26, 36–39) with one landmark study reporting 16% (20). These previously reported rates of complications are difficult to directly compare to this study since both the number and the definitions of complications vary markedly; thus, contributing to differences in complication rates. Three prior studies (2, 8, 20) had comparable definitions, but evaluated a smaller number of types of complications (range for number of complication types, 4–14) versus our study (18 types), with a lower overall complication rate (range, 1–16% vs 21% in our study). However, when directly comparing rates for specific complications with similar definitions to our study, these three prior studies demonstrated relatively similar results: Bourdin et al (2) had three similarly defined types of complications with a rate for any of these three complications of 1.4% versus 5.4% for these three complications in our study; Needham et al (8) had six comparable complications with a rate of 0.7% versus 4% in our study; and

TABLE 3. Highest Level of Mobilization Achieved on Study Day

Level of Mobilization	Total ($n = 775$) (%)[a]	Airway Type[a]		
		Endotracheal Tube ($n = 401$) (%)[b]	Tracheostomy ($n = 308$) (%)[c]	Noninvasive Ventilation ($n = 66$) (%)
Remaining in bed[d]	590 (76)	370 (92)	189 (61)	31 (47)
No mobilization	81 (11)	61 (15)	18 (6)	2 (3)
Turning in bed	342 (44)	224 (56)	110 (36)	8 (12)
Sitting in bed	167 (22)	85 (21)	61 (20)	21 (32)
Mobilized out of bed[d]	185 (24)	31 (8)	119 (39)	35 (53)
Sitting on edge of bed	73 (9)	22 (6)	41 (13)	10 (15)
Sitting in a chair	76 (10)	8 (2)	52 (17)	16 (24)
Standing out of bed	18 (2)	0 (0)	14 (4)	4 (6)
Marching in place	8 (1)	1 (0)	5 (2)	2 (3)
Walking	10 (1)	0 (0)	7 (2)	3 (4)

[a]Data not reported for eight of 783 patients (1%) included in study. Proportions may not add to 100% due to rounding.
[b]Data not reported for seven patients with this airway type.
[c]Data not reported for one patient with this airway type.
[d]$p < 0.001$, by chi-square test, for comparison of airway type for remaining in bed versus mobilized out of bed.

Pohlman et al (20) had 10 comparable complications with a rate of 12.9% versus 11% in our study. Furthermore, given our study included only mechanically ventilated patients, without any type of exclusion criteria (as commonly were applied in randomized trials), this may have contributed to a higher complication rate in our study versus previous studies (6, 7). Finally, many of the prior publications were conducted as single-site research studies in large academic institutions, with specially trained rehabilitation staff, patient exclusion criteria, written treatment algorithms, and specific safety criteria for mobilization interventions. By contrast, our study included all mechanically ventilated patients, with mobilization conducted as part of routine clinical care in a large and diverse group of ICUs, including many nonacademic hospitals that reported higher rates of complications than academic hospitals. This difference in study design, as well as evaluating more types of potential safety events than other studies, may have led to a higher complication rate.

Our study has several potential limitations. First, it is possible that only ICUs with sufficient staffing or interest in early mobilization participated, potentially biasing these results to overestimate mobilization (40). A similar bias also may have resulted due to the self-report of mobilization by clinicians working in the participating ICU. However, self-reporting of patient mobilization in ICUs voluntarily participating in a study is the most feasible method of data collection for large-scale studies and is frequently employed in prior similar studies that may serve as comparators to our study (5–8, 16, 20, 25, 31). Furthermore, to potentially reduce such bias, participants were aware that survey data were anonymous. Second, data collection was based on documentation in medical records, which may have had a potential bias in understating actual mobilization if there were deficiencies in documentation. However, prior research has demonstrated that documentation of out-of-bed patient mobilization—in contrast to other activities—is a high priority within nursing documentation (41) and has substantial agreement with directly observed mobilization in the ICU (42). We are unable to accurately estimate the potential magnitude of any such measurement bias. However, interestingly, a recent Australian-New Zealand point-prevalence study (16) of 514 patients in 38 ICUs also used medical record review and found that no mechanically ventilated patients sat out of bed or ambulated, similar to the findings in our study conducted in Germany. Third, in order to ensure that the survey was feasible to complete with a high response rate and minimal missing data, not all data of interest could be collected (e.g., patient demographic information, duration of mechanical ventilation, level of sedation, severity of illness, or duration of mobilization activities). Future studies should examine such variables and their potential association with mobilization in the ICU. Finally, there may be variability in reporting of mobilization due to differing interpretation of the ordinal scale. However, in both the planning and execution phases of this study, participants did not raise questions with interpretation and use of the scale, which concurs with prior reaction to this scale from a large number of participants in the ICU rehabilitation meeting in which the scale was initially presented and refined.

CONCLUSIONS

In conclusion, in this 1-day German point-prevalence study of 783 mechanically ventilated patients in 116 ICUs, we found that approximately three-quarter of patients were not mobilized out of bed, with standing and higher level mobilization rarely occurring. Mechanically ventilated patients with ETTs were significantly less frequently mobilized out of bed.

TABLE 4. Perceived Barriers to Achieve a Higher Level of Mobilization

Perceived Barrier	Total[a] ($n = 762$) (%)[b]	Remaining in Bed[c] ($n = 587$) (%)[d]	Mobilized Out of Bed[e] ($n = 175$) (%)[f]	p[g]
Any perceived barrier	575 (75)	496 (84)	79 (45)	< 0.001
Specific perceived barriers				
Cardiovascular instability	105 (14)	100 (17)	5 (3)	< 0.001
Deep sedation	87 (11)	86 (15)	1 (1)	< 0.001
Medical contraindication	84 (11)	81 (14)	3 (2)	< 0.001
Other	67 (9)	63 (11)	4 (2)	< 0.001
Too weak	49 (6)	27 (4)	22 (13)	< 0.001
Pain	17 (2)	9 (2)	8 (5)	0.035
Patient not available	14 (2)	14 (2)	0 (0)	0.048
Body mass index > 30 kg/m^2	15 (2)	8 (1)	7 (4)	0.055
Palliative care	25 (3)	23 (4)	2 (1)	0.089
Discontinuation due to anxiety or confusion	24 (3)	17 (3)	7 (4)	0.463
Extracorporeal therapies[h]	23 (3)	19 (3)	4 (2)	0.623
Patient refusal	16 (2)	11 (2)	5 (3)	0.383
No physician order	15 (2)	13 (2)	2 (1)	0.540
Immobile prior to ICU	12 (2)	8 (1)	4 (2)	0.486
No nursing staff available	9 (1)	9 (1)	0 (0)	0.128
Intravascular catheter	11 (1)	7 (1)	4 (2)	0.287
No physiotherapist available	2 (0)	1 (0.2)	1 (1)	0.407

[a]The clinician completing the survey selected the most important perceived barrier preventing each mechanically ventilated patient from reaching a higher level of mobilization.

[b]Sample size for this table is 762 as perceived barrier data were not reported for 21 of 783 patients (2%) included in study. Proportions may not add to 100% due to rounding.

[c]Defined as no mobilization, turning in bed, or sitting in bed.

[d]Total number of patients remaining in bed for the study is 590, with three patients missing data on perceived barriers resulting in 587 patients.

[e]Defined as sitting on edge of bed, sitting in a chair, standing out of bed, marching in place, or walking.

[f]Total number of patients mobilized out of bed for the study is 185, with 10 patients missing data on perceived barriers resulting in 175 patients.

[g]Calculated using Fisher exact test.

[h]Including hemodialysis or extracorporeal membrane oxygenation.

Perceived barriers were reported in 73% of all patients, many of which may be modifiable based on data from the existing ICU literature. The reported rate of complications of mobilization was higher than prior literature, but serious complications were rare with none occurring in patients mobilized out of bed.

ACKNOWLEDGMENT

We are grateful to the members of the German Network for Early Mobilization, the German Society of Specialized Nursing, the German Interdisciplinary Association of Critical Care Medicine, and the German Network Critical Care Medicine for their support and assistance with this research.

We thank the members of the German Network for Early Mobilization for their participation: S. Apel (Clinical Center Lüdenscheid); C. Appelhoff (University Hospital Heidelberg); S. Bänsch (Ev. Hospital Göttingen-Weende); R. Baumeister (Clinical Center Links der Weser); F. Böhm, O. Jeß, S. Klarmann, and M. Schreiter (University Hospital Schleswig-Holstein); F. Brennholz (Filder Hospital); N. Budelmann (Clinical Center Braunschweig); F. Eder (University Hospital Regensburg); I. Ermerling-Heuser (Gemeinschaftskrankenhaus Bonn); I. Fiegler (Clinical Center Wetzlar); J. Groß (University Hospital Münster); C. Heer (Clinical Center Johannes Wesling, Mühlenkreiskliniken); M. Herbert (Hessenklinik Stadtkrankenhaus Korbach); C. Hermes (Helios Clinical Center Siegburg); T. Hooven van den (University Hospital Mannheim); P. Karl (Center for Heart and Diabetes Bad Oeynhausen); H. Keifert (WK-education); F. Kirsch (Clinical Center Crailsheim); N. Krug and N. Schaupp (Neurological Hospital Bad Neustadt); F. Krügel (Diakonissenkrankenhaus Dresden); P. Mansmann (University Hospital of Saarland); G. Niederalt (University Hospital Regensburg); O. Nitsch (St. Marien- and St. Annastiftskrankenhaus Ludwigshafen); A. Panousis (Heart-Center Dresden); A. Pauls (Ev. Hospital Oldenburg); C. Peckelsen

TABLE 5. Most Important Perceived Complication During Mobilization

Complication	Total ($n = 654$) (%)[a]	Mobilized in Bed[b] ($n = 473$) (%)[c]	Mobilization Out of Bed[d] ($n = 181$) (%)[e]	p[f]
Any complication	135 (21)	94 (20)	41 (23)	0.450
Specific complications				
Ventilator dyssynchrony	23 (4)	15 (3)	8 (4)	0.478
Anxiety or confusion	22 (3)	14 (3)	8 (4)	0.341
Oxygen saturation < 85%	19 (3)	13 (3)	6 (3)	0.795
Mean arterial pressure < 55 mm Hg	15 (2)	12 (3)	3 (2)	0.771
Arrhythmia (any type)	12 (2)	10 (2)	2 (1)	0.526
Cardiac arrest	4 (1)	4 (1)	0 (0)	0.580
Disconnection from ventilator	7 (1)	4 (1)	3 (2)	0.403
Bleeding	2 (0)	2 (1)	0 (0)	> 0.999
Mean arterial pressure > 140 mm Hg	5 (1)	2 (0)	3 (2)	0.133
Removal of endotracheal tube	1 (0)	1 (0)	0 (0)	> 0.999
Removal of bladder catheter	1 (0)	1 (0)	0 (0)	> 0.999
Removal of feeding tube	1 (0)	0 (0)	1 (1)	0.277
Removal of intravascular catheter[g]	0 (0)	0 (0)	0 (0)	> 0.999
Fall	0 (0)	0 (0)	0 (0)	> 0.999
Other	23 (4)	16 (3)	7 (4)	0.813

[a]The clinician completing the survey selected the most important complication that occurred during mobilization. Patients with "no mobilization" as their highest level of mobilization were excluded from this analysis ($n = 81$, 10% of 783), 40 patients (5%) had no complications data reported and 8 patients (1%) had no mobilization data reported, leaving a final sample size of 654 patients for this analysis.

[b]Defined as turning in bed, or sitting in bed, those not mobilized at all were excluded from this analysis.

[c]The total number of patients remaining in bed for the whole study is 590, with 81 patients excluded as they were not mobilized at all and therefore were not at risk for a complication during mobilization and 36 patients were missing data on complications resulting in 473 patients mobilized in bed for this analysis.

[d]Defined as sitting on edge of bed, sitting in a chair, standing out of bed, marching in place, or walking.

[e]Data missing for four patients.

[f]Calculated using Fisher exact test.

[g]In the survey, this item was divided into separate complications for peripheral venous, central venous, arterial, and dialysis catheters.

(Clinical Center Harlaching); S. Petras (Clinical Center Niederlausitz); C. Punken and M. Haack (Clinical Center Itzehoe); M. Richter (Clinical Center Landau Südliche Weinstraße); C. Schelling, I. Jung, and A. Gröschel (University Hospital of Saarland, Luisenhospital); C. Schmid (University Heart Centre Freiburg-Bad Krozingen); B. Schmidtgen (University Hospital Dresden); J. Schreiber (GRC Hospital Clementinenhaus); J. Schriewer (University Hospital Erlangen); M. Schwald (Clinical Center Lörrach); A. Strothmann (Clinical Center Itzehoe); C. Wasielewski (Marien Hospital Wesel); M. Westhoff, P. Kramer, M. Kuklinski, and J. Grothe (Pulmonary Hospital Hemer); T. Wittler (Marienhospital Osnabrück); and A. Yeter (Clinical Center Stuttgart).

REFERENCES

1. Bailey P, Thomsen GE, Spuhler VJ, et al: Early activity is feasible and safe in respiratory failure patients. *Crit Care Med* 2007; 35:139–145
2. Bourdin G, Barbier J, Burle JF, et al: The feasibility of early physical activity in intensive care unit patients: A prospective observational one-center study. *Respir Care* 2010; 55:400–407
3. Li Z, Peng X, Zhu B, et al: Active mobilization for mechanically ventilated patients: A systematic review. *Arch Phys Med Rehabil* 2013; 94:551–561
4. Adler J, Malone D: Early mobilization in the intensive care unit: A systematic review. *Cardiopulm Phys Ther J* 2012; 23:5–13
5. Morris PE, Goad A, Thompson C, et al: Early intensive care unit mobility therapy in the treatment of acute respiratory failure. *Crit Care Med* 2008; 36:2238–2243
6. Burtin C, Clerckx B, Robbeets C, et al: Early exercise in critically ill patients enhances short-term functional recovery. *Crit Care Med* 2009; 37:2499–2505
7. Schweickert WD, Pohlman MC, Pohlman AS, et al: Early physical and occupational therapy in mechanically ventilated, critically ill patients: A randomised controlled trial. *Lancet* 2009; 373:1874–1882
8. Needham DM, Korupolu R, Zanni JM, et al: Early physical medicine and rehabilitation for patients with acute respiratory failure: A quality improvement project. *Arch Phys Med Rehabil* 2010; 91:536–542
9. Lord RK, Mayhew CR, Korupolu R, et al: ICU early physical rehabilitation programs: Financial modeling of cost savings. *Crit Care Med* 2013; 41:717–724
10. King J, Crowe J: Mobilisation practices in Canadian critical care units. *Physiother Can* 1998; 50:206–211
11. Lewis M: Intensive care unit rehabilitation within the United Kingdom: Review. *Physiotherapy* 2003; 89:531–538

12. Hodgin KE, Nordon-Craft A, McFann KK, et al: Physical therapy utilization in intensive care units: Results from a national survey. *Crit Care Med* 2009; 37:561–566
13. Skinner EH, Berney S, Warrillow S, et al: Rehabilitation and exercise prescription in Australian intensive care units. *Physiotherapy* 2008; 94:220–229
14. Chang AT, Boots R, Hodges PW, et al: Standing with assistance of a tilt table in intensive care: A survey of Australian physiotherapy practice. *Aust J Physiother* 2004; 50:51–54
15. Wiles L, Stiller K: Passive limb movements for patients in an intensive care unit: A survey of physiotherapy practice in Australia. *J Crit Care* 2010; 25:501–508
16. Berney SC, Harrold M, Webb SA, et al: ICU mobility practices in Australia and New Zealand: A point prevalence study. *Crit Care Resusc* 2013; 15:260–265
17. Nydahl P, Flohr H-J, Rothaug O: [Walking with mechanically ventilated patients. Case description and systematic literature review]. *DIVI* 2011; 2:56–64
18. Hodgson CL, Berney S, Bellomo R, et al: TEAM: A prospective multicentre cohort study of early activity and mobilisation in ICU. *Am J Respir Crit Care Med* 2013; 187:A3625
19. McWilliams DJ, Pantelides KP: Does physiotherapy led early mobilisation affect length of stay on ICU? *ACPRC J* 2008; 40:5–11
20. Pohlman MC, Schweickert WD, Pohlman AS, et al: Feasibility of physical and occupational therapy beginning from initiation of mechanical ventilation. *Crit Care Med* 2010; 38:2089–2094
21. Talley CL, Wonnacott RO, Schuette JK, et al: Extending the benefits of early mobility to critically ill patients undergoing continuous renal replacement therapy: The Michigan experience. *Crit Care Nurs Q* 2013; 36:89–100
22. Nieszkowska A, Combes A, Luyt CE, et al: Impact of tracheotomy on sedative administration, sedation level, and comfort of mechanically ventilated intensive care unit patients. *Crit Care Med* 2005; 33:2527–2533
23. Dinglas VD, Colantuoni E, Ciesla N, et al: Occupational therapy for patients with acute lung injury: Factors associated with time to first intervention in the intensive care unit. *Am J Occup Ther* 2013; 67:355–362
24. Thomsen GE, Snow GL, Rodriguez L, et al: Patients with respiratory failure increase ambulation after transfer to an intensive care unit where early activity is a priority. *Crit Care Med* 2008; 36:1119–1124
25. Leditschke IA, Green M, Irvine J, et al: What are the barriers to mobilizing intensive care patients? *Cardiopulm Phys Ther J* 2012; 23:26–29
26. Needham DM, Korupolu R: Rehabilitation quality improvement in an intensive care unit setting: Implementation of a quality improvement model. *Top Stroke Rehabil* 2010; 17:271–281
27. Kamdar BB, King LM, Collop NA, et al: The effect of a quality improvement intervention on perceived sleep quality and cognition in a medical ICU. *Crit Care Med* 2013; 41:800–809
28. Hager DN, Dinglas VD, Subhas S, et al: Reducing deep sedation and delirium in acute lung injury patients: A quality improvement project. *Crit Care Med* 2013; 41:1435–1442
29. Korupolu R, Chandolu S, Needham DM: Early mobilization of critically ill patients: Screening and safety issues. *ICU Manage* 2009; 9:27–30
30. Korupolu R, Zanni JM, Fan E, et al: Early mobilisation of intensive care unit patient: The challenges of morbid obesity and multiorgan failure. *BMJ Case Rep* 2010; doi:10.1136/bcr.09.2009.2257
31. Kho ME, Korupolu R, Needham DM: Early mobilization of critically ill patients: Feasibility and benefits. *ICU Manage* 2009; 9:31–32
32. Primus R, Korupolu R, Needham DM: Early mobilization of critically ill obese patients. *ICU Manage* 2009; 9:19
33. Damluji A, Zanni JM, Mantheiy E, et al: Safety and feasibility of femoral catheters during physical rehabilitation in the ICU. *J Crit Care* 2013; 28:535.e9–535.e15
34. Rahimi RA, Skrzat J, Reddy DR, et al: Physical rehabilitation of patients in the intensive care unit requiring extracorporeal membrane oxygenation: A small case series. *Phys Ther* 2013; 93:248–255
35. Trees DW, Smith JM, Hockert S: Innovative mobility strategies for the patient with intensive care unit-acquired weakness: A case report. *Phys Ther* 2013; 93:237–247
36. Stiller K, Phillips A, Lambert P: The safety of mobilisation and its effects on haemodynamics and respiratory status of intensive care patients. *Physiother Theory Pract* 2004; 20:175–185
37. Zanni JM, Korupolu R, Fan E, et al: Rehabilitation therapy and outcomes in acute respiratory failure: An observational pilot project. *J Crit Care* 2010; 25:254–262
38. Winkelman C, Johnson KD, Hejal R, et al: Examining the positive effects of exercise in intubated adults in ICU: A prospective repeated measures clinical study. *Intensive Crit Care Nurs* 2012; 28:307–318
39. Clini EM, Crisafulli E, Antoni FD, et al: Functional recovery following physical training in tracheotomized and chronically ventilated patients. *Respir Care* 2011; 56:306–313
40. Isfort M, Weidner F, Neuhaus A, et al: [Situation of nursing and nursing personnel in German hospitals]. *Pflege Gesellschaft* 2011; 16:5–19
41. De Marinis MG, Piredda M, Pascarella MC, et al: 'If it is not recorded, it has not been done!'? Consistency between nursing records and observed nursing care in an Italian hospital. *J Clin Nurs* 2010; 19:1544–1552
42. Koo KKY, Cook DJ, Lamontagne F, et al: Inter-rater reliability of observed, stated and documented acute rehabilitation in Canadian intensive care units. *Am J Respir Crit Care Med* 2013; 187:A5299