Prevalence of Pain in the Medical Intensive Care Unit

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THE PREVALENCE OF PAIN IN THE
MEDICAL INTENSIVE CARE UNIT

A Thesis Submitted to the
Yale University School of Medicine
In Partial Fulfillment of the Requirements for the
Degree of Doctor of Medicine

by
Jennifer Hale Smith
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I measure every grief I meet
With analytic eyes;
I wonder if it weighs like mine,
Or has an easier size.

*Emily Dickinson*
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INTRODUCTION

Pain Is an Important Symptom With Important Consequences

Pain is presumed to be common among patients in the intensive care unit (ICU), although the actual prevalence is unknown. Critically ill patients are particularly vulnerable to pain because of the nature of their illnesses and the diagnostic procedures and treatments required. Moreover, patients may have difficulty reporting their discomfort, because they are intubated or cognitively impaired. Their pain experience may be exacerbated by additional psychological stressors, such as fear and anxiety (1). Improving our approach to understanding and addressing pain in the ICU patient is a growing priority within healthcare. Detecting that pain is an important and difficult first step.

Pain induces physiologic and neurohumoral responses that can be detrimental to critically ill patients. The stress response initiated by pain causes catecholamine release and ramps up the sympathetic nervous system, both of which can lead to diaphoresis, catabolism, and water retention as a result of activation of the renin-angiotensin-aldosterone axis (3). Increased sympathetic activity also increases heart rate, blood pressure, and respiratory rate (1). Finally, activation of the autonomic nervous system can lead to altered pulmonary mechanics, increased work load on the cardiovascular system, altered muscle metabolism, increased oxygen consumption and myocardial oxygen demand, and death (2).

Similar stress responses have been studied in post-operative patients by Kehlet, who found the overall stress response promotes a hypercoagulable state, and therefore the risk of thromboembolic complications (6). Sanders et al discuss the stress response as it correlates to other potentially adverse patient outcomes: “Pain is an activator of the stress response and therefore depresses immune function, affects both myocardial oxygen supply and demand, causes an acute restrictive respiratory defect, and has marked effects on bowel wall motility”(4). Specific immune system changes include an impaired delayed hypersensitivity response to recall antigen stimulation and obtunded T-cell-dependent antibody response, interleukin-2 production, and T-cell blastogenesis. Transformation into a powerful hyperalgesic state of increased sensitivity to painful
stimuli can be induced by the rise in cytokine production (IL-1, IL-6, IL-8, and TNF-α) resulting from tissue injury and inflammation (5).

**We Are Mandated to Control Pain**

Beginning in 1992 with the Agency for Healthcare Policy and Research (AHCPR), a set of clinical practice guidelines for pain management was released in response to wide reports of uncontrolled postoperative pain and emerging data regarding the prevalence and impact of pain (7,8). By the year 2000, organizations such as the American Pain Society, the American Society of Anesthesiologists, and the American Academy of Family Physicians had each published their own sets of guidelines for the assessment and management of pain (7). The issue of pain management gained additional attention when the American Pain Society (APS) coined and trademarked the phrase “Pain: The 5th Vital Sign” in 1996 (9). An initiative was generated around the phrase to emphasize that pain assessment is as important as assessment of the other four vital signs: temperature, blood pressure, heart rate, and respiratory rate, and that clinicians needed to take action when patients report pain. As testament to the appeal of the message to large national healthcare organizations, the Veteran’s Health Administration included pain as the 5th Vital Sign in their national pain management strategy (12).

In 2005 the APS released new guidelines to replace the Quality Improvement Guidelines for the Treatment of Acute pain and Cancer Pain released in 1995, which in their words “effected improvements in pain assessment and prescribing practices, with less effect on patient outcomes” (10,11). Of the 2005 APS recommendations, meant to impact to a greater degree patient outcomes, the APS states, “High quality pain management includes appropriate assessment, including screening for the presence of pain, completion of a comprehensive initial assessment when pain is present, and frequent reassessments of patient responses to treatment, interdisciplinary, collaborative care planning, including patient and family input; appropriate treatment that is efficacious, cost conscious, culturally and developmentally appropriate, and safe; and access to specialty care as needed” (10). While acknowledging that efforts to improve acute pain management must focus on safe, timely, multimodal, and evidence-based
implementation strategies neither set of APS guidelines address specifically the critically ill patient population.

For over 50 years, the Joint Commission on Accreditation of Healthcare Organizations (JCAHO) has been responsible for developing performance measures and standards for hospitals and other healthcare delivery organizations around the nation. Its stated mission is “to continuously improve the safety and quality of care provided to the public through the provision of health care accreditation and related services that support performance improvement in health care organizations”(7). In 2001, JCAHO released pain assessment and management standards for hospitals, health plans, and organizations providing ambulatory care, assisted living, behavioral health care, home care and long term care. The standards “stress patients’ rights to appropriate assessment and management of pain and emphasize that pain should be assessed in all patients”(7). In recognition of the need for alternative approaches in assessing and managing pain for all patients, the standards note that objective physiological and behavioral indicators of pain, like grimacing and tachycardia, are neither sensitive nor specific for pain, and should not replace patient self-report unless the patient is unable to communicate. While this recognition of the patient with diminished capacity for self-reporting may include critically ill patients in some circumstances, JCAHO has not to date released more specific guidelines for pain assessment and management in the critical care setting.

Pain Is Common in Hospitalized Patients

Research on the prevalence of pain in non-ICU populations is abundant (14,36,37,38). One of the largest studies published evaluating the pain experience in seriously ill hospitalized patients was a retrospective chart analysis done by Desbiens et al, examining the findings of the Study to Understand Prognoses and Preferences for Outcomes and Risks of Treatments (SUPPORT) (29,35). Data from interviews about pain were available for 5,176 patients. Pain was reported by 49.9% of patients, with 14.9% of those patients reporting extremely severe pain of any frequency or moderately severe pain occurring at least half of the time. Another 14.9% of patients studied reported being dissatisfied with their pain control. There was a strong association between level of pain and dissatisfaction with pain control—there was a 2-fold increase in the odds of increased
level of dissatisfaction with each 1-point increase in pain intensity level above a level of 2.

In another large cohort, 2415 randomly selected hospitalized patients from five Canadian teaching hospitals were questioned about their pain (38). Fifty percent of the sample reported pain at the time of the interview, though 67% reported pain in the previous 24-hour period. Among the risk factors for pain identified in this cohort, patients who had undergone a surgical procedure in the previous seven days were more likely to report moderate to severe pain. An additional 21% of the non-surgical patients reported moderate to severe pain.

A 1987 study by Donovan et al compared the pain reports of 353 medical-surgical inpatients (14), finding that 58% of patients reported experiencing pain that was ‘horrible’ or ‘excruciating’ at some point in their hospitalization. Despite this majority of patients experiencing a severe form of pain in the hospital, only 45% of patients were able to recall a nurse ever discussing their pain with them. Similar to previous studies, this study found under-dosing of analgesia to less than 25% of what had been ordered per patient. The authors of the study concluded pain in hospitalized patients to be more prevalent than previously reported.

Research into the general hospitalized population has even captured the opinions of the general public regarding the importance of pain relief post-operatively. In a 1997 questionnaire sent to patients of five general medical practices, the 515 respondents expressed varied sentiment regarding the degree to which pain should be treated (19). There was no consensus among respondents as to whether “you should put up with a bit of pain rather than complain”, with 46% agreeing and 44% disagreeing. In response to the issue of “If you are sore or in pain, your pain should not be taken away completely,” the largest percentage of respondents (35%) agreed, with 30.1% disagreeing, and 23.7% of respondents being unsure. This study illustrates the variation in public opinion as to the importance of pain control; while a significant proportion of people disagree that pain should be tolerated, almost equal proportions are unsure or believe that it should be tolerated.
Preliminary Studies Suggest Pain is Common in ICU Patients

Several studies have described the prevalence of pain in the general patient population (14,29,36,37,38), but few have focused specifically on the critically ill. Much of the literature has focused on post-ICU interviews with patients (13,17,27,33). In one of the earliest published studies, Puntillo interviewed 24 patients from two hospitals following their transfer from the ICU (13). Seventeen of 24 (71%) recalled being in pain while in the ICU, of which 15 patients (63%) described their pain as moderate to severe.

Stein-Parbury et al compiled a review of 26 research studies published between 1967 and 1997 on patients’ experiences in an ICU with particular emphasis on studies that addressed patient recall of the ICU experience, psychological stressors in the ICU, and experiences with mechanical ventilation (17). The most frequently cited discomfort in patients’ reports of their ICU stays was pain. In the study by Rotondi et al, 96 patients were interviewed regarding their recall of pain during their ICU stay (27). Of the patients interviewed, 37 patients (38.5%) remembered being in pain. Of these 37, 32 recalled being moderately or extremely bothered by pain.

Whipple et al studied pain management in critically ill trauma patients, interviewing 17 in the initial stages of their ICU stay, as well as nurses and physicians. Patients were interviewed twice using a verbal pain intensity scale, and were asked to rate pain intensity on a scale of 0 (no pain) to 10 (the worst possible pain). In addition, patients were asked if they wanted stronger does of pain medication, whether they received pain medication, and if so, whether they were satisfied with its effect. Thirty-one interviews were conducted: in 27%, patients reported moderate pain, and in 47%, they reported severe pain.

In a study of 43 cardiac ICU patients recovering from coronary artery bypass grafting, Ferguson et al investigated pain intensity and pain distress ratings (41). At five points post-operatively, patients rated pain intensity between 3.0 (SD±2.73) to 6.26 (SD±2.42). In a descriptive, correlational study on patients’ perceptions of pain and acute pain management practices, Carroll et al interviewed patients and nurse leaders from 13 hospitals and reviewed patient charts (20). Patients were asked how often they experienced moderate to severe pain in the ICU, choosing responses ranging from ‘never’
to ‘always’. Of 213 patients, 64% were often in moderate to severe pain while in the ICU. High pain intensity correlated with longer stays in the ICU.

Nelson et al studied the symptom experience of 50 critically ill cancer patients in the ICU using the Edmonton Symptom Assessment Scale (ESAS) and patient ratings of pain intensity and discomfort related to common ICU diagnostic and/or therapeutic procedures (33,34). Interviews were conducted one time with patients while they were in the ICU in which they completed the ESAS and commented on their pain using both 4-point numerical rating scale and verbal descriptors of their pain from ‘none’ to ‘severe’. Of patients responding, 56% reported experiencing pain during their ESAS questionnaire. Of those, approximately 65% experienced moderate pain while 35% had severe pain in the ICU. Approximately 50% of patients reported moderate discomfort in the ICU and approximately 25% rated this discomfort as severe.

The studies described above have elicited patient pain experiences through patient recall of their ICU experience and through interviews during their ICU admissions. Several studies that comment on the prevalence of pain do not provide additional detail regarding specific aspects of pain, such as intensity or the timing of its occurrence, often because the design of the study omitted certain details. One example of this is the study by Nelson et al, which found an approximately 56% prevalence of pain, but failed to comment on the number of patients this represents in total and by pain description. The study by Puntillo reported pain ratings, but only through ICU recall and with an overall enrollment of 24 patients. Whipple et al captured two interviews with patients while in the ICU, while achieving a similarly small total enrollment of 17 patients. None of the studies provide patient report of the ICU pain experience through interviews both during and after their ICU admission. Lastly, the ability to compare responses from patients across studies is hampered by the diversity of methods used to document pain. One study specifically asked the frequency of moderate to severe pain experienced in the ICU, with answer choices ranging from ‘always’ to ‘never’. Other studies reported on pain ratings using a 0 to 10-point numeric rating scale, the most commonly recognized scale of measurement in current use. Other studies comment on the prevalence of pain as a symptom reported by patients, and often do not ask patients to qualify the pain further. In these cases, meaningful information regarding the severity and intensity of pain is
missed, as is the opportunity to use that information to study potential risk factors and predictors for pain.

**Many Elements of ICU Care Can Be Painful**

The typical ICU patient’s experience is characterized by exposure to multiple noxious stimuli and procedures, including surgery, endotracheal intubation, chest-tube placement, catheterization, intravenous and intra-arterial testing and monitoring, physical immobility, and physical maneuvering by caregivers (23,24,25). A 1994 study by Puntillo investigated the pain associated with the use of two common ICU practices—the removal of chest tubes and endotracheal suctioning (23). The study compared the magnitude and dimensions of pain associated with endotracheal suctioning and chest tube removal in the intubated and nonintubated patient. While patients reported both procedures to be painful, they assigned higher pain intensity to chest tube removal (mean 6.6) than endotracheal suctioning (mean 4.9) on a 0 to 10 pain scale. According to the authors, despite being intubated, patients “were able to communicate extensive information about procedural pain.”

Nelson et al found that critically ill cancer patients identified endotracheal suctioning, endotracheal and gastric tubes, mechanical ventilation, arterial puncture, and turning to be the most painful or discomforting procedures in the ICU (33). Among the uncomfortable procedures identified, endotracheal suctioning was performed most frequently at a mean of 26.5 times per patient. Five of the 12 most painful procedures identified by patients were performed an average of more than four times per patient during their ICU stay. Arterial punctures were performed an average of 2.1 times per patient during their ICU stay.

Stanik-Hutt et al studied pain in 30 traumatically injured adults during the first 72 hours of hospitalization. Pain was measured consecutively using two questionnaires at two time-points—when patients were supine and after being turned onto their side (26). Immediately after being turned, mean scores on a 0 to 100-point visual analog scale increased from 25 to 48.1 \((P = .002)\). Some patients refused to turn, and those patients were found to have higher scores on the visual analog scale at rest \((P = .02)\) and less anxiety \((P = .02)\) than did those who permitted themselves to be turned.
In another study, Puntillo described the pain associated with several ICU procedures, such as turning, wound drain removal, endotracheal suctioning, femoral catheter removal, placement of a central venous catheter, and non-burn wound dressing change. This associated pain was compared with the frequency of use of analgesics during procedures (24). Numeric rating scales were used to obtain data from 5957 adults, and additional data were recorded regarding the usage of pre-procedure analgesia in the patients studied. Mean pain intensity scores on a 0 to 10 scale for all procedures were 2.65 to 4.93. The most painful and distressing procedure was turning. Only 17.4% of patients received pre-procedure opioid analgesia. Patients reported that even when procedure-related pain was mild, the cumulative effect of the repetitive painful experience could make the pain seem worse to them. A study of this size contributes a great deal to our knowledge of the painfulness of certain ICU procedures; however, it cannot inform us of the pain of ICU patients that is not related to procedures. That is, the pain patients may be feeling when inactive. This and the previously cited studies reporting rates of ICU procedural pain do not tell about the pain of patients apart from that which is induced by these procedures. Moreover, we do not know how patients who did not receive these procedures would describe their pain.

Some studies have examined pain in the ICU using patient recollection. In a study examining ICU patients’ recollections of stressful experiences, Rotondi et al interviewed 150 patients mechanically ventilated for ≥ 48 hours (27). One-half (75) recalled the endotracheal tube. 51 of those patients answered ‘Yes’ to the questions of whether the endotracheal tube caused them pain or discomfort; of these, 42 stated they were moderately or extremely bothered by the tube. Through the recollections of 100 ICU patients, Turner et al found that the most frequently reported “unpleasant experiences” for patients were arterial blood gas sampling (48 of 100 patients reported) and tracheal suctioning (30 of 68 ventilated patients reported) (30). Pain of all causes—including that induced by procedures, endotracheal tubes, and immobility—was a problem for 22% of 100 patients interviewed. The use of recall studies such as these may introduce recall bias into patient reporting of their ICU experience. Such studies are designed to report experiences through recall of the ICU experience as told by patients after their ICU
discharge. What these studies do not tell us about is anything that the patient may no longer recall by the time the interview occurs. In order to know what patients were experiencing in the ICU, it may be better to study them in the ICU.

**Pain May Be Difficult to Detect in the ICU**

Some studies have highlighted the barriers to detection of pain in the ICU. Puntillo identified endotracheal tubes in 19 of 24 (80%) patients as a physical barrier to self-report of pain (13). Patients able to talk reported communicating their pain by asking for pain medication. Patients who could not talk recalled enacting behaviors in sometimes unsuccessful attempts to let the staff know they were in pain—such as signaling with their eyes, using facial expressions or hand motions, or moving their legs and feet up and down. Illustrating the challenge of communicating, one subject explained, “I would try to tap on the bed with my hand, but they had both my hands restrained so that I couldn’t turn. I would try to grab the nurse by the arm and not let go because I was hurting so much.”

Patients may find their efforts to communicate misinterpreted. In a review of 26 research studies examining patients’ experiences of being in an ICU, Stein-Parbury et al cited two studies in which patients attempted to adjust their endotracheal tubes themselves for greater comfort (17). In each instance, patients reported that nurses misinterpreted their actions as aggression towards their ventilators. Patients recalled being threatened with restraints, or actually having their hands restrained as a result. Patients described these types of events as leading to greater frustration, anxiety, and discomfort on their part.

Pain detection is made more difficult by patients who fail to report they are in pain to their caregivers. Reasons patients do this may relate to their low expectations about pain relief, believing it inevitable as a symptom and impossible to control (18). This is confirmed by studies that indicate patients endure higher levels of pain than necessary rather than asking for greater pain control (18, 21). Whipple et al encountered a somewhat mixed message with regard to patients’ desires vs. their requests for medication when it came to their pain control (22). In 31 interviews with patients in which 47% reported severe pain, only 65% and 47% of those with moderate to severe
pain asked their nurse and physician for more medication for pain, respectively. These findings of low patient self-reporting of pain echo findings from studies of postoperative patients as well (16). Whipple et al found fear of narcotic addiction to be reported by only 19% of these patients. Overall it remains unclear why patients frequently do not report pain to caregivers.

**We Question How Effectively ICU Pain Is Treated**

As demonstrated by the research findings of Stein-Parbury et al and Puntillo, over-reliance on patient behavioral indicators can lead to misinterpretation of patients’ actions, and inadequate detection of pain (13,17). In the critical care setting patients’ physiologic responses are sometimes used to assess pain. In these instances, caregivers look to commonly recognized physiologic and behavioral indicators of pain, such as heart rate, blood pressure, diaphoresis, tearing, mydriasis, body posturing, and/or guarding (13,45,46). As Sanders et al points out, over-reliance on some of these factors can mislead caregivers (4). For example, patients experiencing mild pain often can have an overall greater behavioral response to pain through movement than patients in moderate to severe pain, who may maintain an immobile position. In another example they discuss the use of catecholamine infusions in the critically ill patient, which are known to lead to mydriasis and tachycardia, two commonly recognized physiologic responses to pain that are secondary to increased autonomic activity (3). The use of morphine for pain relief in critically ill patients may cause miosis regardless of whether pain control has been optimized. At the same time, in a patient who is under-medicated with morphine, miosis could be mistaken for an absence of pain. While neither of these examples presents a compelling reason not to continue to monitor physiologic and behavioral signs of pain, they do raise valid points about the extent to which we can reasonably rely on these variables alone for assessing pain or the adequacy of pain control in our patients.

Some studies have illustrated disagreement between patient and caregiver responses to questions intended to assess patient pain and discomfort. (17,20,22,41). Stein-Parbury et al found in their literature review of 26 separate research studies on patients’ pain in the ICU that ineffective communication between patients’ and staff, especially among patients receiving mechanical ventilation, led to increased patient
distress, feelings of helplessness and unrecognized pain (17). The restrictions that patients experienced in their ability to communicate resulted in unmet needs for better explanations from nurses of what was occurring. In some instances of ineffective communication, patients reported feeling that staff exacerbated their frustrations by suggesting that they “should not worry about it” (17).

When Ferguson et al compared patients’ and nurses’ pain intensity scores as reported in five post-operative interviews, they found that nurses consistently rated patients’ pain lower than patients themselves (41). In only one of those interviews did the authors find a significant difference between patient and nurse pain ratings, when patients rated their pain to be an average of 5.6 on a 10-point scale with nurses rating their average pain a 4.4. The authors concluded that nurses’ adequate management of patient pain requires regular systematic pain assessment, improved communication, and the administration of adequate pain relief medications.

In their study of trauma patients in the initial days of their ICU stay, Whipple et al compared the opinions of 17 trauma patients about the adequacy of their pain control with those of their nurses and physicians (22). They found that 81% of the nurses interviewed reported that patients received adequate pain control, despite the fact that 53% of those nurses were caring for patients who reported an average pain level of 8. In interviews with housestaff, 95% reported that patients received adequate pain control, stating that they depended upon “personal observations, physical findings, and the nurses to evaluate the adequacy of pain control” and 53% did not ask the patient if analgesia was sufficient. They found that 75% of housestaff interviewed reported that patients received adequate pain control, though like nurse, the average level of pain reported by their patients was 8.

The study identified caregiver concerns about the side effects of narcotic analgesia. Thirteen of 19 housestaff interviewed cited concerns about respiratory depression or hypotension when explaining why they did not prescribe larger doses of morphine for their patients. Other reasons identified by the authors for inadequate patient pain control include patient fear of addiction, caregiver overestimation of narcotic administered, and problems with caregiver documentation of pain assessment. Overall a majority of patients were thought to be receiving less than adequate pain control in the
study, as evidenced by the fact that 74% of them rated their pain intensity as moderate to severe.

Based on their findings, Whipple et al concluded that barriers to adequate pain control in the ICU patients they studied included the following: disparity in the perception of pain between patients and caregivers; patients not requesting more analgesia despite the presence of moderate to severe pain; and physician and nurse concerns about patients’ adverse physiologic response to increased doses of narcotic analgesia.

It Is Important to Study the Prevalence of Pain in the ICU

Preliminary studies suggest that many patients experience moderate to severe pain while in the ICU, but many of these studies have used only post-ICU interviews with patients, introducing the possibility of patient recall bias regarding their ICU pain experience. Obviously, recall studies fail to capture the experience of patients who cannot recall their ICU experiences, but this often is due to circumstances common to the ICU, such as amnesia, delirium, and sedation, suggesting a greater likelihood for missing certain patients’ experiences. Failing to account for these patients may lead to false estimations of the true prevalence of pain in the ICU. Many of the recall studies were designed with a focus on describing patient recall, while commenting on the prevalence of pain—the recall of pain—as an incidental component of a separate aim. Even among studies designed to detect ICU pain through patient recall, without also measuring pain while in the ICU at the time it is experienced, there is no way to know how accurate this form of detection is.

Some prior research focused on the ICU patient symptom experience has provided insight into the patient pain experience. Such symptom-experience summaries often include important information about the patient pain experience, but do not provide other pertinent details, such as whether patients were at rest at the time of interview or whether the pain being reported was experienced throughout their ICU admission or occurred less than that. Still needed are studies designed specifically to determine the prevalence of ICU pain in a well-described manner.
Previous ICU studies that have intended to document the prevalence of pain have followed patients for up to two days, sometimes providing multiple ratings in one 24-hour period. Patient interviews conducted over more days in the ICU are necessary to include data on the frequency and severity of ICU patients’ pain over time. This would require studying the ICU experience through consecutive patient interviews over multiple days.

Most recent studies have used 0 to 10-point rating scales for patient self-reporting of pain intensity, which is the most commonly recognized standard for pain measurement. Despite having widespread clinical use in evaluating acute pain, to date this scale has not been validated with many unique patient populations, including the critically ill. In addition, few if any ICU studies have used additional methods in combination with the numeric rating scale, such as verbal rating scales that employ terms like ‘none’ and ‘moderate’, to describe patient pain concomitantly. The value in such a study design would be to compare responses from single patients across all measures, and to compare all patients’ responses to one another. The subjective nature of the pain rating makes it impossible to determine if and how closely patients’ pain experiences are related when they assign equal numeric ratings. For example, how does Ms. Gallagher’s “5” compare to Mr. Franklin’s? The use of more than one pain rating method at a time would provide opportunity to characterize pain further and to compare patients’ responses across numeric and descriptive ratings.

Few studies have investigated ICU patient satisfaction with pain control while documenting the prevalence and severity of pain. Studies of the general population suggest that patients may have low expectations for pain control. ICU studies suggest patients may not be reporting their pain to caregivers, but we do not know the degree to which these patients are satisfied overall with their pain control. We do not know to what extent a patient’s choice not to report pain correlates with satisfaction with pain control or severity of pain, nor how all three aspects compare across all patients in an ICU. Determining the prevalence and severity of pain in patients while asking them questions about pain reporting and pain control will provide important information about the degree to which patients are exercising choice in realizing adequate pain control.
We have seen data to suggest that physician and nurse caregivers have difficulty detecting ICU patients’ pain due to barriers to communication and impaired patient self-report of pain. Other data suggest there may be a failure to detect pain in patients who are communicating well. Some data shows that caregivers may be aware of pain, but are hesitant to treat it due to concerns over side effects from medications used in critically ill patients. Very few studies have attempted to interview both nurses and physicians—in addition to patients—to evaluate their ability to detect pain, or to study their opinions on pain severity and adequacy of control. Simply put, such studies are needed. Studying both physicians and nurses would allow for comparison of their rates of success in detection of pain and adequacy of pain control, and in the event of significant differences, may serve to enhance each other’s practices. Furthermore, we do not know if, in cases where caregivers fail to detect pain, there is any correlation of this with low patient satisfaction with pain control. Finally, studies designed to compare caregivers’ opinions on the adequacy of pain control with those of patients over several days will identify if, and by how much, rates of detection of pain in patients and adequacy of pain control vary over time.

Hypothesis and Specific Aims of the Study

Given the challenges to assessing pain in the ICU setting, we have generated the following two-part hypothesis: 1) caregivers often fail to identify pain in the critically ill population, and 2) we may be under-treating ICU patients’ pain. The primary aim of the study is to determine the prevalence of pain among patients in the Medical ICU able to participate in an interview. We attempted to study all patients who were willing and able to participate by reliably answering questions about their pain daily. A secondary aim of the study is to compare patients’ responses to questions meant to identify the presence and intensity of pain and adequacy of their pain control to those of their RNs and physicians.
METHODS

Patient Population:

We studied 129 patients admitted to the Medical Intensive Care Unit (MICU) of Yale-New Haven Hospital (YNHH) between November 18, 2002 and June 18, 2003. All patients were identified through the MICU census, and discussions with nurses and physicians. The study was approved by the Human Investigations Committee (HIC) of the School of Medicine, which did not require written, formal consent. We attempted to enroll all eligible MICU patients in the study, while informing patients and families of their right to decline enrollment. After identifying patients that met inclusion criteria (see below), the nurse assigned to the patient was consulted for permission to speak with the patient to ensure that the patient would be capable of completing the interview without interruption and without disturbing any patient care activities already in progress. Nurses were consulted prior to meeting with patients with the belief that they were most familiar with their patients’ conditions and could inform interviewers of patient’s ability to participate in the study. In cases in which a relative or surrogate decision-maker was identified by the nurse or researcher as a surrogate responder for the patient, that individual(s) was asked for permission to enroll the patient in the study. In such cases, the use of the surrogate decision-maker was temporary, and patients were interviewed directly about their pain on subsequent occasions.

Study enrollment and data collection were limited to the Monday through Friday schedule between the hours of 9am to 6pm. Patients were eligible for study enrollment 24 hours after their admission to the MICU.

Inclusion criteria:

- Age ≥ 18 years
- English as a primary language
- Admitted to MICU at least 24 hours prior to enrollment

Exclusion criteria:

- Patients less than 18 years of age
- Patients unable to consent to participation independently, or for whom family members refused participation in the study (as a surrogate decision-maker)
- Patients who were actively dying, and/or patients for whom the family was standing vigil. (It was felt that these patients would not be capable of participating and that seeking participation at those moments would seem insensitive.)

**Staff Population:**
We interviewed 61 MICU RNs and 64 MDs (limited to house-staff) for the duration of the study to compare their responses to questions about pain to those of their enrolled patients. The decision to interview the primary RNs and MDs daily was based on the belief that they formulate with regularity a working opinion of the individual patient’s pain based on their discussions with the patient and their assessments of the patient’s condition. All RNs and MDs caring for enrolled patients were eligible and were approached for study participation on a daily basis as new patients were enrolled in the study. As staffing changes occurred, new RNs/MDs were enrolled to maintain continuity in data collection for a particular enrolled patient.

**Patient Data Collection:**
For all patients enrolled in the study, data were collected during three general time periods: at baseline of enrollment, daily during their MICU admission, and on days 3 and 7 post-MICU discharge (limited to patients discharged from the MICU to other units of Yale New Haven Hospital). It was felt that the patient’s primary nurse was the most appropriate individual to assess ability to participate (e.g., whether the patient was awake, sedated, receiving visitors or treatment, ineligible for enrollment, etc.) on a daily basis.

Baseline data was recorded through extensive patient chart review and during the initial patient interview (see Appendix A, Entry Sheet and General Pain Rating Score). At baseline, severity of illness was assessed using the Acute Physiology and Chronic Health Evaluation (APACHE II) scoring system (54). Patient diagnoses were categorized using the SUPPORT diagnoses scoring system (35), which defines critical diagnostic groups with an estimated 50% 6-month mortality. In order to assess patients’ ability to reliably
participate in the daily pain interviews using a pain rating scale of 0 to 10, and to have reference point for comparison of patients’ daily pain ratings related to their MICU experience, we asked patients to complete a four-question interview at baseline rating four different experiences on a 0 to 10 pain scale. The four experiences were: brushing a feather across a foot, breaking an index finger, receiving a flu shot in the arm, and having a limb amputated without anesthesia.

Daily patient data collection consisted of daily patient-reported pain ratings, pharmacological treatments for pain, the most recent set of vital signs, and a survey of invasive procedures applied in the previous 24 hours. This was completed through patient interviews and chart review (see Appendix A, Patient’s Daily Alertness/Pain Assessment Sheet and Patient Daily Assessment Sheet). Patient pain was reported using 1) a 0-10 pain scale, and 2) a verbal rating scale from which one description is chosen from no pain, mild, moderate, and severe.

Upon entering patient’s room daily, the interviewer recorded the patient’s level of sedation using the Richmond Agitation Sedation Scale scoring system (see Appendix A, Patient’s Pain: Alertness Assessment) (2,3). Patients who were deeply sedated, unarousable, or overly agitated were not interviewed at the discretion of the interviewer. Patients’ interviews were conducted according to the above-described methodology. If patients were judged to be unable to participate based on their response (or lack thereof) to questions, the specific questions on the interview form were coded either “Did not understand’, ‘Missing’ or ‘Asked, can’t answer’. Patients demonstrating difficulty with verbal communication (e.g., intubated), and who were otherwise alert and responsive, participated by gesturing in response to verbal questioning from the study coordinator to designate the desired answer. Patients were asked to follow simple verbal commands (e.g., “Wiggle your toes”) to demonstrate their understanding of the command and ability to complete the gesture.

Patients discharged to other units of YNHH were followed for up to one week post-MICU discharge to assess their recollection of their admission to the MICU (see
Appendix A, Discharge Sheet, General Pain Rating Score, and Patient’s Follow-Up Alertness/Pain Assessment Sheet). Patients were interviewed on days 3 and 7 (or as close as possible) post-discharge with questions about their memories regarding their pain experience while in the MICU after an assessment of their level of sedation. Patients also were asked to repeat the General Pain Rating Score questionnaire post-MICU discharge.

RN and MD Data Collection:
We queried staff for general pain ratings and perceptions of enrolled patients’ pain experience. In the same way we asked patients to complete a four-question general pain rating interview, we asked staff to do the same in order to have a source of comparison for their intensity ratings of patients’ pain. Data was collected from RNs and MDs at two general time periods: at their enrollment in the study and daily for the duration of a patient’s stay in the MICU. All RN and MD study enrollment correlated with an enrolled patient. Any RN/MD assigned to care for an enrolled patient on a given day was considered eligible for study enrollment. RN/MD inability or refusal to participate in the study did not impact attempts at patient enrollment, nor did it affect patient data collection. Likewise, patient inability or refusal to participate on a given day did not impact data collection from nurses and/or physicians on that day.

Upon study enrollment, RNs and MDs were asked baseline data pertaining to general pain ratings (see Appendix A, General Pain Rating Score). After enrollment, RNs and MDs were interviewed regarding their beliefs about their patient’s pain experience that day (see Appendix A, Nurse’s Daily Pain Assessment Sheet and Physician’s Daily Pain Assessment Sheet). All attempts were made to interview enrolled RNs and MDs in temporal proximity—preferably within one hour—of the time of daily patient interviews. Interview times were recorded on patient and RN/MD interview forms.

Specific data included the following:
- Patient age, gender, race (determined through designation in medical record), date of enrollment, pain medications actively taken as of time of hospital admission,
acute conditions patient had at time of MICU admission, chronic conditions patient had at time of MICU admission

- Dates of hospital and MICU admission
- SUPPORT (35) diagnoses present within first 24 hours in MICU
- APACHE II (54) score calculated based on first 24 hours in MICU
- Patient, RN, and MD responses to the General Pain Rating Score at time of enrollment (see Appendix A)
- Patient responses to the General Pain Rating Score at days 3 & 7 post-MICU discharge (see Appendix A)
- Pain medications, sedatives, neuromuscular blockers, and vasopressors received in the previous 0 to 24 hours
- Use of invasive devices in previous 0 to 24 hours
- Vital signs (temperature, blood pressure, pulse, respiratory rate, oxygen saturation, pain rating) at the time of interview
- Nursing record of completed pain assessment and Ramsay (53) scores per shift
- Patient RASS (51,52) score at interview, date and interview time
- Patient responses to questions in Patient’s Daily Alertness/Pain Assessment Sheet (see Appendix A)
- RN/MD, respectively, responses to questions in Nurse’s/Physician’s Daily Pain Assessment Sheet (see Appendix A)
- Date of patient MICU discharge and discharge disposition
- History of code status orders placed during MICU stay, including date, care goals, specific code status (DNR, DNI, etc.), and any other orders related to resuscitation.
- RASS (51,52) score and patient responses to questions in patient’s Follow-Up Alertness/Pain Assessment Sheet

Data Analysis

Data was analyzed using Microsoft XP Access and Excel software. Description of the study population included medians with interquartile ranges as well as percent frequencies as appropriate. In order to account for multiple responses from individual
participants, the prevalence of pain, pain rating scores (including general pain ratings), verbal pain descriptions, and answers to follow-up questions about pain were calculated in two ways: 1) per interview/occasion on which the question was asked, 2) per study participant through calculation of a composite score. Composite scores were used to calculate the responses to pain questions as a method for determining whether patients were experiencing a symptom/condition a majority of the time. A participant’s composite score was calculated based on the number of positive responses to the query divided by the total number of responses provided for each question. All ‘yes’ or ‘no’ responses were converted to ‘1’ and ‘0’, respectively, to calculate the composite score. For example, if a patient reported being in pain on 3 of the 5 occasions the patient was interviewed, then the composite prevalence of pain score for that question would be 3 (=1+1+1+0+0), or >0.5 (or 50%) of the occasions on which the patient was interviewed. In this example, the patient would be considered to have been “in pain”.

Composite pain intensity ratings (0-10 numeric rating scale) were calculated as a median of all the scores given on occasions when the patient, RN, or MD reported pain. Composite pain descriptions (none to severe) were calculated by assigning a numeric value to the descriptor. For example, ‘none’ was equal to a score of 0, ‘mild’ a score of 1, ‘moderate’ a score of 2, and ‘severe’ a score of 3. Median scores were tallied from these numeric ratings, and the score was then translated back into the pain description it represented. In the event of fractions, the numeric score was rounded to the nearest whole number and then translated to the corresponding pain description. For example, if a patient described pain as ‘moderate’ on 2 occasions (=2+2), and ‘mild’ on 2 occasions (=1+1), then the median score would be 1.5, which would be rounded to 2, for a median pain description of ‘moderate’.

Patient and caregiver interviews were matched through study identification number and date to compare interviews completed for the same study participant on the same day. These are referred to as patient-RN and patient-MD matched interviews. Sensitivity and specificity results were calculated using patient and caregiver responses to test caregivers’ ability to detect pain and related factors. Sensitivity refers the percentage of caregivers that accurately predicted the symptom/condition. Specificity refers to the percentage of caregivers who accurately predicted those patients who did not have the
symptom/condition. Likelihood ratios (LR) were calculated as a global summary of sensitivity and specificity. LR was calculated using the standard equation: 
\[ LR = \frac{\text{sensitivity}}{(1-\text{specificity})}. \]

Patients who completed interviews both in the ICU and at follow-up had their responses matched for comparisons. Composite scores were calculated in instances when more than interview was completed in either location for a study participant, which were then used to compare patient responses to questions.

SPSS 13.0 statistical software was used for statistical analyses. Cross-tabs with Pearson chi-square tests for significance were used for simple significance testing. A p-value of <0.05 was defined as statistically significant. All distributions required non-parametric testing, thus the Kruskal-Wallis, Mann-Whitney U, Wilcoxin, and Spearman’s rho tests were used, when appropriate.

The Prevalence of Pain in the Medical Intensive Care Unit study was approved by the Yale University School of Medicine Human Investigations Committee under protocol #17534. This study was conducted by Jennifer Smith, Mark D. Siegel, M.D., and Kathy Engle, RN. The study was conceptualized, the hypothesis was formulated, and the research plan was composed by Mark D. Siegel and Jennifer Smith. Data was collected and subject interviews were conducted by Kathy Engle and Jennifer Smith. Follow-up data was collected by Jennifer Smith. Mark D. Siegel assisted with the evaluation of the data and writing of the thesis.
RESULTS

Description of Study Population

One-hundred and twenty-nine patients were enrolled during the study period. Out of 301 patients hospitalized in the MICU during the study period, 172 were not enrolled for one of more of the following reasons: patient did not wish to participate, patient’s surrogate responder did not wish for the patient to participate, patient’s admission to the MICU was less than 24 hours in length, patient or surrogate responder did not speak English.

Of the 129 patients enrolled, the median age was 70 (IQR 55-78). Fifty-five percent were Male. Seventy-five percent were White and non-Hispanic, and the next greatest percentage was Black and non-Hispanic (19%). Five percent were Hispanic (Table 1.1). Eleven percent were recorded as actively taking a narcotic class pain medication on admission to the hospital, the most common being oxycodone (n=6). Seventeen percent were recorded as actively taking a non-narcotic pain medication at the time of admission to the hospital. Most patients (87, 68.3%) were not actively taking pain medication at the time of hospital admission.

Data on patient diagnoses and median severity of illness score are listed in Table 1.2. The most frequent acute illnesses diagnosed on admission to the MICU were respiratory failure (78, 62%), pneumonia (53, 42%), sepsis (30, 24%), and shock (26, 21%). The most frequent chronic illnesses presenting on admission were heart diseases, including CAD, valvular heart disease, and arrhythmias (49, 39%). Forty-one percent (53) patients had a SUPPORT diagnosis at enrollment, with the most frequent diagnoses being: Acute Respiratory Failure (37, 29%) and Multiple-organ System Failure and Sepsis (24, 19%). The median APACHE II score was 18 (IQR 13-23).

The median MICU length of stay was 6 days (IQR 3-16), while the median total hospital length of stay was 17 days (IQR 10-35). Twenty-nine percent (38) of enrolled patients were discharged to home, while thirty percent (36) died during their hospital admission. The remaining patients were discharged to the following locations: inpatient
rehabilitation (24, 19%), extended care facilities (20, 13%), and hospice (5, 4%). (Table 1.3-1.4).

Of the 30% (36) of patients who died during their hospitalization, 67% (24) deaths occurred during an ICU admission (MICU or other ICU) and 33% (12) deaths occurred in non-ICU hospital settings. There was a total MICU mortality rate of 19% (24 patients) of our study population, compared to the overall mortality rate of 27% (81 of 301) for all patients from the same MICU during the same period. Of enrolled patients, 44% (57) had at least one active set of code status orders while enrolled in the study, with the majority of active orders (60%, 49) being Do Not Resuscitate (DNR) orders. (Table 1.5).

**Pain Ratings of Patients, Nurses, and Physicians**

Three-hundred and twelve general pain rating questionnaires were completed, with the majority (159, 51%) being from enrolled patients. Enrolled RNs completed 30% (93) of general pain rating questionnaires and MDs completed 19% (60).

General pain rating scores are illustrated in Figure 2.2. Average scores were used when participants answered the question more than one time. All three groups responded to the scenario “A feather brushing over your foot” with a median intensity rating of 0 (IQR 0-0). Seventeen patients gave “A feather brushing over your foot” a pain intensity rating greater than 0. The Kruskal-Wallis test was used to compare the three groups, finding that the patient ratings differed significantly from RNs and MDs (p=0.001). Patients, RNs, and MDs all found “Having your leg amputated without anesthesia” to equate to a median pain intensity rating of 10 (IQR 10-10). Patients rated “Breaking your index finger” lower than the other groups, giving it a 6.5 (IQR 5-9). RNs rated “Breaking your index finger” an 8 (IQR 6-9), and MDs rated it an 8 (IQR 6-8) (p=0.07). “Receiving a flu shot in your arm” was rated by patients, 2 (IQR 1-3), and by RNs and MDs, 2 (IQR 2-3) (p=0.31).

Both patient and RNs had subjects who were interviewed multiple times. Of 27 RNs interviewed multiple times, 89% (24) changed answers from the previous general pain rating interview, though this change was not significant (p=0.8). In 54% (13 of 24) of interviews, 2 answers were changed (p=0.8). Of 49 patients interviewed more than
once, 92% (45) gave different answers between interviews (p=0.5). Seventy-one percent (32 of 45) changed 2 or more answers between interviews (p=0.8).

**Results of Pain Questionnaires—Summary of Interviews of Patients**

A total of 549 patient interviews were attempted, of which 48% (262) of interviews were completed successfully, and were distributed among 94 study participants (Table 2.3). Of the 52% (287) of interviews not completed, the nurse caring for the patients reported the patient as being unable to respond to questions in 37% (105) of instances. The study coordinator found the patient unable to respond to questions in 26% (75) of instances. The patient was asleep in 14% (39) of attempted interviews, and 24% (68 interviews) were not completed for reasons that included the patient was found to be too agitated, and/or the nurse or family of the patient did not want the interview to be conducted, or for other reasons not provided (Table 2.2).

Forty-four percent (115) of responses to the question “Do you have any pain right now?” from all patient interviews were positive (Table 2.3). Of patient interviewees reporting being in pain, 42% (47) describe that pain as mild, 37% (42) describe it as moderate, and 18% (20) describe their pain as severe. Four percent (4) patients described their pain as ‘none’. Using the 0 to 10 pain scale, there was median pain intensity rating of 6 (IQR 4-7.5) from all interviewees reporting pain (Table 2.3).

Interviewees in pain reported telling an RN/MD about their pain 81% (87) of the time while stating that they had not 19% (21) of the time. Sixty-one percent (67) of respondents in pain stated the RN/MD had given them medication for their pain, 37% (41) responded they had not been given medication for their pain, and 2% (2) were unsure. To the question of whether they have been receiving adequate pain control, 72% (75) responded yes, 26% (27) responded no, and 2% (2) were unsure (Table 2.3).

Data on the use of invasive equipment and vital signs for all interviewees can found in Table 2.0-2.1. Patients in pain had a median pulse rate of 92 (IQR 76-118) vs. 87 (IQR 75-104) for patients not in pain (p=0.05). Of 51 of 115 patients in pain known to have an endotracheal device, 75% (38) had an oral endotracheal tube or tracheostomy vs. 13 patients in pain who did not have either device (p<0.001). 44 patients in pain had a Foley catheter in place vs. 71 patients in pain who did not (p=0.01).
Results of Pain Questionnaires—Summary of Interviews of RNs

A total of 600 interviews were attempted with nurses, of which 87% (521) were completed successfully on 116 different study participants (Table 2.4). The reasons for RN non-completion of the daily interview were: RN on unit but unavailable, 58% (46) of cases; RN recently began shift and had not assessed the patient, 15% (12) of cases; and other reasons, including RN declined participation and reason unspecified, 27% (21) of cases (Table 2.2). The number of interviews in which the patient and the nurse both responded to at least the question of whether the patient was in pain currently (patient-RN matched interviews) was 203. The median length of time between patient-RN matched interviews was 15 minutes (IQR 4.8-42.6).

The percent of interviews in which the RN believed the patient to be in pain was 31% (161). The RN felt the patient was not in pain in 64% (332) of interviews, and was unsure in 5% (28) of interviews (Table 2.4). When asked to describe the pain level of patients in pain from ‘no pain’ to ‘severe’ pain, 66% (106) of nurses responded ‘mild’, 30% (48) responded ‘moderate’, 3% (5) responded ‘severe’, and 1% (2) were unsure. The median pain intensity rating given by RNs for all interviews in which they believed patients to be in pain was 3 (IQR 2-5) (Table 2.4).

Nurses responded that the patient had received medication for the pain they were thought to be experiencing in 63% (102) of interviews, and had not received medication in 36% (58) of interviews. In 79% (127) of interviews the RN responded that he/she felt the patient was receiving adequate pain control, while the RN responded ‘No’ to this question in 16% (26) of interviews, and in 5% (8) of interviews was unsure (Table 2.4).

Results of Pain Questionnaires—Summary of Interviews of MDs

A total of 440 pain interviews were attempted with MDs, of which 49% (214) were completed successfully on 87 different study participants (Table 2.1). The reasons provided for MD non-completion of the daily interview were: MD on unit but unavailable, 48% (107) of cases; MD off unit, 40% (91) of cases; reason not specified, 9% (20) of cases; MD has not assessed patient, 2% (5) of cases; and MD refused, 1% (3) of cases (Table 2.2). The number of interviews in which the patient and MD both
responded to at least the question of whether the patient was in pain currently (patient-MD matched interviews) was 75. The median length of time between patient-MD matched interviews was 40 minutes (IQR 15-85 minutes).

Physicians believed patients to be in pain during 28% (60) of interviews. The MD believed the patient was not in pain during 50% (107) of interviews, and was unsure if the patient was in pain during 22% (47) of interviews (Table 2.5). They rated patient pain as ‘mild’ in 57% (34) of interviews, ‘moderate’ in 37% (22) of interviews, ‘severe’ in 2% (1) of interviews, described the patient’s pain as ‘none’ in 2% (1) of interview, and were unsure in 3% (2) of cases. The median pain intensity rating given by MDs for all patients reported to be in pain was 3 (IQR 2-4.8) (Table 2.5)

Of 60 interviews in which patients were believed to be in pain, MDs responded that the patient had received medication for pain in 70% (41) of interviews. In 19% (11) of interviews MDs responded that the patient had not been treated for pain, and was unsure in 12% (7) of cases. In 75% (44) of interviews the MD responded that he/she felt the patient was receiving adequate pain control, while the MD responded ‘No’ to this question in 17% (10) of interviews. The MD was unsure if the patient had adequate pain control in 9% (5) of interviews (Table 2.5).

Results of Pain Questionnaires—Composite Scores from Patients, RNs, and MDs

Composite scores were calculated for pain questions to determine whether a patient was experiencing the symptom/condition the majority of the time. 94 unique patients responded to prevalence of pain questions. Of them, 46% (43 patients) had a composite score positive for pain (i.e. they were in pain at least half the time when asked). The composite median pain intensity rating among participants in pain was 6 (IQR 4.5-8.0) (i.e., this represents the median of pain intensity ratings describing the overall experience of pain as opposed to each individual experience). Patients who stated their pain was ‘mild’ rated it a median of 4 (IQR 4-5.5), those with ‘moderate’ pain gave it a median pain rating of 6 (IQR 6-7), and patients in severe pain rated it a median of 8 (IQR 7.5-9) (Table 4.1). Thirty-eight patients responded to the adequacy of their pain control, with 68% (26 patients) stating it was adequate, 29% (11 patients) stating it was not, and 3% (1 patient) being unsure. Thirty-five percent (14 patients) stated they had not
received medication for their pain, 63% (25 patients) stated they had received medication, and 3% (1 patient) was unsure. In terms of pain reporting to RN/MD, 85% (35 patients) reported they had and 15% (6 patients) reported they had not. (Table 2.3)

Nurses commented on the prevalence of pain for 115 unique study participants across all RN interviews completed. Of these, RNs gave a composite of 29% (33 patients) in pain, 69% (79 patients) not in pain, and for 3% (3 patients) RNs were unsure (Table 2.4). RNs gave a composite median pain intensity rating for patients believed to be in pain of 3 (IQR 2-4). Composite pain descriptions for all occasions on which RNs believed patients were in pain were as follows: 64% mild (21), 33% moderate (11), and 3% unsure (1). RNs felt patients in pain had adequate pain control 91% (30) of the time, were unsure 6% (2) of the time, and felt patient pain was inadequately controlled 3.0% (1) of the time. RNs believed 67% (22) of patients in pain had received medication for their pain and that 33% (11) of patients were not medicated for their pain (Table 2.4)

Physicians responded to pain questions for a total of 78 study participants, of whom they believed that 31% (24 patients) were in pain overall, 64% (50 patients) were not in pain, and they were unsure about the pain of 5% (4 patients). The median pain intensity rating given by MDs for patients they believed to be in pain overall was 3 (IQR 2-4.3). MDs described the overall pain to be mild in 54% (13 patients), moderate in 38% (9 patients), none in 4% (1 patient), and were unsure about 4% (1 patient). MDs felt 78% (18 patients) had overall adequate pain control, 13% (3 patients) had inadequate pain control, and were unsure about the adequacy of pain control in 9% (2 patients). MDs responded that 70% (16 patients) in pain received medication for their pain, 17% (4 patients) in pain were not medicated for their pain, and were unsure about 13% (3 patients) (Table 2.5).

**Results of Interviews Matched By Patient & Caregiver**

Of the 203 patient-RN matched interviews in which both the patient and RN responded to the question of whether the patient was in pain, both subjects were in agreement in 65% (131) of interviews that either the patient was or was not experiencing pain at that time (Table 3.1). The prevalence of pain in patient-RN matched interviews was 43% (88) based on patient responses. The sensitivity of RNs to patients in pain was 48%. Nurses correctly predicted patients were not in pain in 89 instances, giving a
specificity of 77%. The likelihood ratio that RNs would correctly identify patients in pain is 1.9.

In 192 patient-RN matched interviews regarding adequacy of pain control, both subjects agreed 83% of the time (160 cases) that patient pain was adequately controlled (Table 3.2). Of the 23 patients who reported inadequate pain control, the RN was never aware.

Of the 75 patient-MD matched interviews in which patients and MDs both responded as to whether the patient is in pain, the rate of agreement between both subjects was 75% (56 interviews) (Table 3.3). The sensitivity of MDs to patients in pain was 73%, as MDs correctly predicted patients were in pain in 22 of the 30 instances in which patients themselves reported being in pain. MDs correctly identified patients who were not in pain in 34 of 45 cases, for a specificity of 76% (p<0.001). The likelihood ratio that MDs would correctly identify a patient in pain was 2.7.

There were 77 cases in which both patient and MD responded to whether the patient had adequate pain control, with both subjects were in agreement for 91% (70) of them (Table 3.4). MDs were able to detect inadequate pain control in 43% (7) of cases. MDs detected adequate pain control in 67 of 70 cases, or 96%. The likelihood ratio that MDs would correctly detect adequate pain control in patients was 1.7.

Follow-Up Interviews with Patients

Follow-up interviews with participants after discharge from the MICU were attempted on 98 occasions. A total of 81 interviews were completed a median of 5 days post-discharge (IQR 4-7). Composite scores were calculated for 62 unique study participants, who completed follow-up interviews a median of 1 time each (IQR 1-2). Of these, 68% (42 patients) recalled their ICU experience. Fifty-seven percent (24 patients) recalled experiencing pain in the ICU based on composite scores from follow-up interviews. Of these patients, 29% (7 patients) gave a composite pain description of ‘severe’, 29% (7 patients) described it as moderate, and 29% (7 patients) described it as mild. Thirteen percent (3 patients) did not provide a pain description. There was a composite median pain intensity rating of 6 (IQR 5-8) for all patients who recalled pain. A total of 41% (17 patients) recalled being treated for pain in the ICU, while 50% (21 patients) did not. Of all patients who recalled the ICU, a composite total of 67% (28
patients) stated they had adequate pain control in the ICU. Seven percent (3 patients) stated they had inadequate pain control in the ICU. Patients rated their overall ICU experience using the same 0 to 10-point rating scale, except with ‘0’ being the lowest rating and ‘10’ the highest. Patients who recalled the ICU experience gave it a composite median rating of 8 (IQR 7-10) (Table 3.5).

Thirty-eight patients were matched for interviews completed in the ICU and at follow-up. Composite scores from interviews in each location were used for data and statistical analyses (Tables 3.6-3.9). Sixty-five percent (15 patients) were able to recall their ICU pain at follow-up. None of the 5 patients who had reported inadequate pain control in the ICU reported this at follow-up. There was a composite median pain intensity rating from the ICU interviews of 6 (IQR 6-8). The composite median pain intensity rating from patients interviewed at follow-up recalling their ICU pain was 6.3 (IQR 5-8). Ninety-five percent (19 of 20 patients) who reported adequate pain control in the ICU repeated this at follow-up. Seventy-five percent (12 patients) who reported being treated for their pain in the ICU recalled their treatment at follow-up. Forty-four percent (4 patients) who described their pain as severe in the ICU also did so at follow-up. Forty-four percent (4 patients) who reported ‘no pain’ in the ICU also did so at follow-up.

Of the 42 patients who recalled their ICU experience, 98% (41 patients) were able to rate their overall ICU experience on a 0 to 10-point scale. The median overall ICU rating was 8 (IQR 7-10) for all patients, with ‘10’ being the highest possible rating. When broken into groups, patients who recalled ICU pain gave a median overall ICU rating of 8 (IQR 7-10), compared with a median rating of 8 (IQR 7-9) from patients who did not recall pain in the ICU. This difference was not statistically significant, p=0.6. The 3 patients who recalled having inadequate pain control in the ICU during the follow-up interview rated their overall ICU experience a 6 (IQR 5.5-6), compared to a rating of 8 (IQR 7-10) from patients who recalled having adequate pain control in the ICU. This difference was found to be statistically significant with a p=0.01, although it must be emphasized that the group of patients who recalled in adequate pain control was very small (n=3), compared with the 38 patients who recalled their pain control to be adequate in the ICU.
Patient Pain Relationship to Other Factors

Pain was not shown to have a statistically significant relationship to patient gender (p=0.8) or race (p=0.8). Patients in pain had a median age of 65 (IQR 53-76) vs. a median age of 73 (IQR 63-81) for patients not in pain, though this difference was not significant (p=0.09). The relationship between report of pain (‘yes’ or ‘no’) and pain description (‘none’ to ‘severe’) was statistically significant, p<0.001. Patient pain ratings from 0 to 10 related significantly to patient pain descriptions from ‘none’ to ‘severe’ (p=0.01). Spearman’s rho test showed high correlation (coefficient 0.9/p=0.01) between pain 0-to-10 rating and pain description from ‘none’ to ‘severe’ when looking at all patients. A similar, though less strong, correlation was found between the two variables in patients reporting pain (Spearman’s rho coefficient 0.6/p=0.01). Patients in pain were more likely to report inadequate pain control (p=0.01), to have reported this to their RN/MD (p=0.002), and to have reported being medicated for their pain (p=0.002).

DISCUSSION

Summary of Findings

Presence of Pain

Patients in our sample were experiencing considerable pain. When looking at all interviews, there was a 44% prevalence of pain. When looking at patient composite scores based on all interviews per patient, the prevalence of pain was 46%.

Of the hypothetical pain ratings, there was only one significant difference among all three groups with regard to how they rated each of the four events. Patient ratings differed significantly from those of RNs and MDs on the question of the potential painfulness of “A feather brushing over your foot” (p=0.001). While all three groups gave this event a rating of 0 (IQR 0-0), there were 17 patients who rated it greater than 0, a finding that differed significantly from the other two groups. It is unclear why a small group of patients would identify this event as minimally painful as opposed to rating it a ‘0’, which is ‘no pain’, and why this would differ from RNs and MDs. One hypothesis is that some patients may suffer from neuropathic changes that cause them to experience normal stimuli as painful on a regular basis. For these patients, a feather brushing over
their foot may very well elicit a painful reaction, and they are aware of this. In support of this hypothesis, this difference in ratings was not observed in the equally extreme ratings assigned to the question of “Having your leg amputated without anesthesia”, which received a median pain score of 10 (IQR 10-10) from all three groups with no significant difference among ratings per group. Although not a significant difference, patients rated “Breaking your index finger” as less potentially painful at 6.5 than both RNS and MDs, who both rated the event an 8.

Presence of pain was statistically related to higher pain intensity ratings using both scales—the 0 to 10-point scale (p=0.01) and the pain description from ‘mild’ to ‘severe’ (p<0.001). This finding suggests that in terms of communicating the severity of pain, either method is useful. A statistically significant relationship was found between median numeric pain ratings and the specific pain descriptor (from ‘mild’ to ‘severe’) assigned by patients in pain. For reasons that are not entirely clear, 4% (4 patients) who stated they were in pain described their pain as ‘none’. One possible explanation for this is that these patients in fact did not understand the question. In addition, we know that there is a relationship between delirium and the perception of pain among hospitalized patients, and that delirium is commonly found in ICU patients. We did not screen for delirium in our study population, and we cannot rule out the presence of delirium among patients in our study which would impact their ability to respond reliably and coherently to questions.

When looking at all patients with or without pain by self-report, there was a high correlation between pain rating per the 0-to-10-point scale and the pain description per the ‘none’ to ‘severe’ scale (Spearman’s rho coefficient 0.9/p=0.01). However, when comparing the two variables only in patients who were currently experiencing pain, the correlation was not as strong (Spearman’s rho coefficient 0.6/p=0.01). This suggests that the two scales used to describe pain are not perfectly correlated. Most likely, including patients who are not in pain in the calculation of correlation here decreases the variation in responses because most patients not in pain choose the one option on each scale that clearly describes this—‘0’ and ‘none’—with few deviations. Alternatively, patients who are in pain select a variety of numeric ratings and verbal descriptors to characterize their pain, because pain is defined differently for different people. For example, a ‘5’ may
mean ‘moderate’ pain to some patients and ‘severe’ pain to others, just as a ‘7’ is ‘moderate’ pain for one patient and ‘severe’ pain for another. What emerges from this data is that neither scale perfectly describes the pain that patients are experiencing.

We found a relationship between presence of pain and reporting pain to the RN/MD (p=0.002), reports of having been medicated for pain (p=0.002), and reports of inadequate pain control from patients (p=0.01). When examined more closely, the data indicates that a large majority of patients (81%) reported pain to RN/MD when they experienced it, while reporting receiving medication for said pain only 61% of the time. We do not know how often patients desired medication for pain, though 37% of patients in pain stated they had not received medication for pain. While 72% of patients in pain reported adequate pain control, approximately ¼ of patients (26%) felt their pain control was inadequate.

*Risk Factors for Pain*

According to the findings of our study, vital sign measurements are a poor indicator of the presence of pain in patients. Of all vital signs measured, patient pulse rate was the only one to show a relationship with presence of pain in patients (p=0.05). Differences in systolic and diastolic blood pressures and respiratory rate were not found to be statistically significant. Our data showed an interesting split in terms of the relationship between potentially noxious stimuli and pain. We found a significant relationship between pain and the placement of endotracheal tubes/tracheostomies as compared to patients in pain who did not have these devices (p<0.001). However, we found no such significance in the relationship between patients in pain and the placement of nasogastric/orogastric tubes. Furthermore, patients in pain were less likely to have a Foley catheter than not (p=0.01), suggesting that this device is quite the opposite of a noxious stimulant. It is important to note, however, that this is univariate testing and that these data may be confounders. Also important to note regarding these findings is that we did not collect data on these devices in all patients, and thus do not know if these results would remain as such if we had.

*Detection of Pain*
Nurses may be unaware when patients are in pain according to data from patient-nurse matched interviews. Nurses had relatively low detection of patients in pain (sensitivity 48%). Nurses also seemed unaware when patients felt their pain control was inadequate, accurately identifying none of the 23 patients who reported this.

Nurses also may be unaware of the severity of patient pain according to nurse-patient matched interviews describing pain from ‘no pain’ to ‘severe’. Nurses detected 71 of 105 instances in which patients described their pain as ‘no pain’ (specificity 68%). Though, in cases in which pain was present, as patients began describing their pain from ‘none’ to ‘severe’, the ability of nurses to accurately match patients’ descriptions varied. Of patients reporting mild pain, nurse sensitivity was 36%. Nurse accuracy increased slightly in detecting patients with moderate pain (sensitivity 46%). The nurse was unable to accurately describe the pain of the one patient who described their pain as ‘severe’, which the nurse described as ‘mild’.

Physicians appeared more aware of patients in pain according to the data from patient-physician matched interviews, however, there are approximately 2.5 times fewer physician-patient matched interviews than nurse-patients matched interviews. Still, physicians seemed more aware of overall patient pain (sensitivity 73%) and of inadequate pain control (sensitivity 43%), though in the latter case, the number of matched interviews was only 7. The LR of physician detection of overall patient pain was 2.7, while the LR of physician detection of inadequate pain control was 10. We do not know if these results would hold if the physician response rate had been greater.

Both nurses and physicians appear more aware of patients who have adequate pain control than those who do not, with respective sensitivities of 95% and 96%.

The overall low sensitivity of nurses and physicians to patient pain is perplexing, particularly in the absence of an overwhelming failure to detect inadequate pain control on their parts, or overwhelming reports of inadequate pain control from patients. One could easily reason that a patient with inadequate pain control is more likely to be identified as in pain than the patient who does not report this but that is in pain nonetheless. Are caregivers not asking patients about their pain? This is possible, though it is equally possible that patients are not communicating their pain to their caregivers when asked unless they feel their pain control is inadequate. If so, why would patients not
report their pain to caregivers and yet report it to our interviewer? Perhaps patients feel they should be experiencing some pain, and therefore, are experiencing their pain silently.

**Recall of Pain**

Approximately two-thirds of patients who completed pain questionnaires in the ICU were able to complete follow-up interviews after their discharge from the MICU. Slightly more than two-thirds of those patients (42, 68%) were able to recall their ICU stay. These 42 patients represent 45% of patients from the entire study able to recall their ICU experience.

Over half of patients who recalled the ICU experience were able to recall experiencing pain in the ICU. Thirty-eight patients who completed follow-up interviews were matched with their ICU interviews. A statistically significant relationship existed between the patients who recalled ICU pain and those who reported pain while in the ICU (p=0.03). A significant portion of patients (35%) were unable to recall accurately their ICU pain when looking at patient matched interviews at both intervals. These data—along with the percentages of patients who report recall of the ICU and of ICU pain—are suggestive of precisely how many patients have difficulty recalling their ICU experience. From the perspective of studying patient pain in the ICU, they suggest that recall studies may be a poor proxy for capturing the ICU experience.

When patients were asked to rate their overall ICU experience on a scale of 0 to 10, almost 98% of patients assigned it a median rating of 8 (IQR 7-10). This is a considerably high rating and suggests an overall positive ICU experience, in our opinion. The rating did not differ significantly whether or not patients reported recalling ICU pain. However, patients who reported having inadequate pain control in the ICU at follow-up rated their overall ICU experience a 6 (IQR 5.5-6), a significant difference (p=0.01) from the ICU rating given by patients who believed their ICU pain to be adequately controlled. This finding is not surprising, as one would expect a patient who felt their pain control to be insufficient to rate the overall experience lower than another patient who did not feel this way. It should be emphasized, nonetheless, that the patients who reported inadequate pain control was a very small group (n=3) compared to those who did not (n=38).
**Strengths of the Study**

Strengths of the current study include the recruitment of a large number of patient participants over the 7-month period of active enrollment. Similarly, being able to follow patients over a series of interviews about their pain provided an opportunity to gain greater insight into the individual’s pain experience.

Use of the general pain rating scale in which patients and caregivers alike rated four hypothetical events on a scale of 0 (no pain) to 10 (the worst possible pain) allowed for interesting comparisons of how these subsets of the general population consider the notion of pain. These experiences were not necessarily painful, so the degree to which a measure of pain was assigned to them is also informative. Are there confounding factors that incite higher ratings from one group over another?

Because the 10-point pain rating scale has never been validated for use with the critically-ill population, it was helpful and informative to compare its results alongside of the simultaneous use of the pain descriptions from ‘none’ to ‘severe’. The use of both measures allowed us to compare how well they correlate to one another, as well as how sensitively caregivers assessed pain using both.

Interviewing patients after ICU discharge allowed us to both gauge overall patient recall of the ICU experience and to compare patients’ responses to questions about pain both during and after the experience.

Interviewing patient caregivers has proven invaluable in answering questions about how practitioners believe patients are feeling vs. how patients report feeling themselves. It provides us important insight as to how well we are detecting and treating patient pain, and may serve to inform the future pain assessment and treatment practices of this ICU.

**Limitations of the Study**

Limitations of the current study include the observation that ICU participants and practices were studied in a manner restricted by the staffing schedule of the study. Patients were interviewed during regular business hours on a Monday through Friday weekly schedule. As such, it is possible that practices may have been different in the ICU
during the many occasions when the study coordinator was not present. Eligible patients and staff present on weekends only were not enrolled, thus diminishing our efforts to capture the true ICU population among the study group. For this particular ICU, more senior nurses often work weekends, which suggests that the study findings may have been different if all time periods had been included. Study data indicate an enrollment size that is 43% of the overall population in this ICU, which likely was impacted by the consistent loss of enrollment over weekends. Continuity of data collection was interrupted for enrolled patients through this weekly loss of days, which impacted our ability to gather useful data that would more fully characterize the patient ICU experience.

Every effort was made to interview eligible patients and staff daily in a non-disruptive manner given the time commitment and energy required of participants to answer pain questions. However, a limiting aspect of this sample was our deference at times to nurse opinions regarding the ability of patients to participate in interviews, as this may have introduced a degree of bias to the data set. Staff opinions regarding the eligibility of patients to be interviewed on a daily basis must be weighed against the need to realize a clear and consistent approach to obtaining interviews. While we managed to obtain interviews from a large subset of patients, it is difficulty to know exactly who may have been missed by uniformly deferring to nurses in determining who to interview. It is possible that mostly patients who would not be capable of participating (which was our hope) would have been screened out through this process, but it is equally possible that the process left out some patients who, for all intents and purposes, were as eligible to participate as those who were eventually enrolled. That is to say, in an ideal world, the greater majority of this discretion would be left to the study coordinator through previous communication with nursing and other staff. Another limitation of this study was arrangement of interviews with staff and patients around other important patient care activities in a manner which pre-empted and at times hampered the completion of interviews. The large number of interviews completed suggests this was not a major issue. Additionally, it is not clear that completing these interviews would have impacted overall prevalence of pain.
Another limitation of the study related to the population was our inability to capture the non-English-speaking patients, which introduces the possibility of missing a substantial amount of input. In a study so intricately connected to the concept of barriers to communication and the risks that these may introduce, there is significant potential for losing relevant patient perspectives through language screening in this way. The study did not intend to include non-verbal patients unable to communicate using non-verbal gestures. This is estimated to be a sizeable portion of all ICU patients; however a study of this population would require use of different methods to assess pain. It would be useful to know the percentage of patients in the ICU who were not enrolled because they were not verbal and were unable to respond to questions using gestures, a detail that we did not record.

Patients in our study were not screened for the presence of delirium, although we know that the incidence of delirium among critically-ill patients is considerable. We also know that delirium has been shown to have a relationship with the perception of pain. Without knowing if our patients were experiencing delirium by screening for it specifically, we cannot fully know that they understood the questions being asked of them, although we used questions to evaluate alertness and ability to follow commands. In the future, it would be useful to know what percentage of patients are experiencing delirium by screening for it in order to evaluate both the response rates to questions as well as the responses themselves.

The setting of the study was a single Medical ICU in a major university hospital. In order to determine if the findings of our study can be generalized to other ICUs, it would be useful to study patients in other ICUs within the same hospital.

The nature of the study as a daily interview with caregivers and patients about the ICU pain experience could impact the practices of this unit. We cannot rule out the possibility that caregiver pain assessment and management behaviors were impacted by the daily presence of the research team. Future studies may consider randomizing the interviews of staff to a less regular schedule to avoid the expectation of an inquiry into their pain assessment or control practices, an inquiry which over time may lead to changing practices. Also, it might be useful to interview some patients about pain in a
way that staff were unaware that this were happening and then to compare prevalence of pain rates among all interviews.

Of the caregivers successfully interviewed for the study, nurses represented the overwhelming majority at 71% of all completed caregiver interviews. Ideally caregiver response rates would have been more equivalent between the two groups. We are not sure of exactly why we effected such low physician response rates. As physicians are responsible for determining the pain medication regimen for all ICU patients as well as the overall pain management plan, which is included in their daily assessments and plans for patients, their perspective on the prevalence and intensity of patient pain is an important one. Housestaff involvement in various daily activities away from the bedside of individual patients (daily educational conferences, work rounds in other locations, etc.) made it difficult to complete interviews with them on a consistent basis. If future studies determine that the physician interviews are an important aspect of the overall data collected, greater efforts must be made to ensure these interviews are completed. One possible alternative would be to offer the physician a written interview form to be completed in their own time (though as soon as possible) if they are absent or unavailable at the initial approach of the study coordinator.

Implications

The findings of the present study of a prevalence of pain between 44% and 46% among patients are lower than those of recall studies in which patients are reporting about ICU pain after discharge. Puntillo (13) found 71% of ICU patients recalled having pain in the ICU, while Nelson et al (33) found 56% of critically ill cancer patients recalled having ICU pain. Of that sample, an even greater 75% recalled having ICU discomfort, though the authors do not specify how pain and discomfort relate to one another. The aim of Nelson et al was to study the ICU symptom experience through patient report. It represents one of many recall studies that comment on the ICU patient pain experience without specific aims to study it. Rotondi et al (27) reported on recall of ICU pain by 39% of patients of patients they interviewed about stressful ICU experiences who felt pain as a result of mechanically ventilation. Our study is different from these studies in that patient pain reports were captured at the time of the experience as opposed to
through recall. Additionally, with respect to the Rotondi et al study specifically, we studied pain in and of itself, and not as a secondary effect of a separate cause.

The size of our study sample—129 patients—is similar to the ICU recall studies of Turner et al (100 patients), Nelson et al (100 patients) and Rotondi et al (150 patients) (30,33,27). Turner et al (30) did not intend to study specifically study pain in patients, though found pain to be a factor present in the ICU. The ICU pain recall study of Puntillo (13) captured the perspective of a smaller group of 24 patients; however, it was designed specifically to study the recall of ICU pain, unlike the other studies mentioned. The prospective ICU studies of Ferguson et al (41) and Whipple et al (22) also had smaller sample sizes than our study, at 43 and 17, respectively, though despite this difference, they represent the studies with a design most similar to ours. In both studies, patients were interviewed more than one time about their pain while they were in the ICU.

The method we used to calculate prevalence of pain—and other study variables—by creating composite scores for study participants may be viewed as arbitrary. We counted patients as experiencing pain and other symptoms if they reported so in 50% or more of their interviews. It was felt that this would be the most judicious way to calculate prevalence of pain to ensure that the responses of individuals that were interviewed multiple times did not impact the overall percentage disproportionately, while also taking into account the range of each individual’s answers. To gauge the degree to which this method of calculation may have affected the resulting prevalence of pain, we alternatively calculated presence of pain as a factor of the responses given by participants on only the first occasion that they were interviewed. The result was a prevalence of pain of 42.6%, which is essentially similar to what we found using composite scores.

The benefit of calculating responses as product of the majority response given is that, as mentioned above, it allows for some degree of consideration of all the responses a participant gave over the course of their participation in the study. It would be to the detriment of our findings if we did not attempt to capture the overall essence of an individual participant’s responses, as this method intends to do.

We found higher patient median pain intensity ratings (6, IQR 4.5-8) than pain intensity ratings in the study of post-operative cardiac patients by Ferguson et al (41). Patients in that study reported a range of mean pain intensity scores between 3.05 to 3.74
and 4.91 to 6.33, which represented the mean pain intensity ratings for patients’ average and worst pain experienced, respectively. Like the present study, Ferguson et al collected pain intensity ratings on multiple occasions while patients were in the ICU. Unlike Ferguson et al, we did not ask patients to report their ‘average’ or ‘worst’ pain, though our patients were asked to describe their pain in addition to providing a numeric rating. Carroll et al (20) found a mean pain intensity rating also similar to our findings in their study of 213 critically ill postoperative and trauma patients. Patients rated their mean worst pain intensity after surgery as 6.4 (SD±2.86).

In terms of the pain descriptions used by patients for their ICU pain, our study found among composite scores, 37% described their pain as mild and 40% of patients described their pain as moderate. About 21% of patients described their pain as severe the on the majority of occasions they were interviewed. In comparison, Whipple et al (22) reported higher percentages of patients in severe pain, with moderate pain in 27% and severe pain in 47% of patients interviewed (n=32). In the study by Carroll et al (20), 18% of patients reported experiencing moderate to severe pain often after surgery, while 4% of patients reported experiencing this level of pain often after their surgery. In her recall study of pain in 24 ICU patients, Puntillo (13) reported 63% of subjects reported pain as moderate to severe, and 29% reported severe pain.

When Ferguson et al (41) asked patients to numerically rate their ‘average’ and ‘worst’ pain, patients automatically correlated a numeric rating with a pain description. As the numeric pain rating scale has never been validated for use in critically ill patients, these types of studies are useful in characterizing pain further and defining the categories and ratings commonly used clinically. Our study found a statistically significant relationship between the median numeric pain rating and the pain descriptor assigned by the patient. In addition, there was a high degree of correlation between pain intensity ratings and pain descriptions. Perhaps these and other data may someday contribute to designing a definitive study to validate the use of the 0 to 10-point numeric rating scale in the ICU population.

That we found prevalence of pain to be related to patient heart rate cannot be corroborated by other ICU studies on the prevalence of pain. Vital statistics have been studied in relationship with the pain experience, but simply have not been reported in
previous ICU prevalence of pain studies. While vital signs are not a surrogate for asking patients if they are in pain, they may be a useful source of input when there are no alternatives available. In terms of our finding of a relationship between increased heart rate and pain, we do not know the absolute cause of this relationship. Perhaps pain contributes to an increased pulse rate. Perhaps patients in pain also have other conditions that cause increased heart rate. This should be investigated specifically in future studies.

We found pain statistically, though contrastingly, related to the use of two common ICU devices. Patients in pain were more likely to have an endotracheal tube in place. We also found that almost twice as many patients with pain did not have Foley catheters as those that did. Several ICU recall studies have investigated pain related to ICU procedures. Rotondi et al (27) found 68% of patients recalled pain related to the endotracheal tube and 82% of these patients were moderately to extremely bothered by this pain. Nelson et al (33) concluded the absence of a connection between procedure-related pain and recall of ICU pain or discomfort may have been related to the practice of liberal premedication and analgesia of patients. Of patients who did report pain related to procedures in their study, the most painful were reported to be endotracheal suctioning, arterial blood gas puncture, endotracheal and nasogastric tubes, and turning.

Our findings of a relationship between pain and common ICU devices seems somewhat incidental in that we did not ask patients about their pain in relation to common ICU devices, but rather identified the relationship statistically. Actually, our study design may have been somewhat ambitious in attempting to gather information about ICU devices in addition to studying the prevalence of pain without specifically tying the two phenomena together. We no more found that endotracheal tubes cause pain than that we discovered that Foley catheters diminish it; however, our findings do suggest these areas are ripe for continued study. Neither of the two prospective ICU studies on the prevalence of pain (41,22) reported data regarding ICU procedures and devices. It is possible that the patients we studied may have been receiving more/less pain medication at the time of the interview to impact their pain experience as much as these devices did, an effect that has been suggested by Nelson et al (33). Future studies should be carried out to investigate procedural and device-related ICU pain.
Our study supports the findings of previous work (41) that reported nurses consistently rated patient pain intensity lower than patients did themselves. In that work, Ferguson et al reported that across ten separate measurements asking RNs and patients to rate patients’ pain, RNs gave lower numeric pain ratings using a 0 to 10-point scale. In our study, median pain intensity ratings from both RNs and MDs were lower than pain intensity ratings given by patients themselves. Both caregivers gave a median pain rating of 3 (IQR 2-4), compared to a median pain rating of 6 (4.5-8) from patients. It is not clear why caregivers would rate patient pain lower than patients themselves and in such similar ways when comparing RN and MD ratings. One possibility is that caregivers may not discuss pain as specifically with patients as would be required in order to develop a closer approximation of their experience when asked. Perhaps it would be useful for future studies to ask caregivers on what factors they base their estimations of patients’ pain if we are to ask for their estimations at all.

When comparing prevalence of pain in patients to detection of pain by caregivers, RNs were aware that patients were in pain 48% of the time and MDs were aware 73% of the time. Notably, MDs were evaluating approximately 2.5 times fewer patients as fewer MD-patient patched interviews were completed.

Regarding the adequacy of pain control, the majority of patients who experienced pain during most of their interviews said their pain was adequately controlled—that is, 68% answered the question yes the majority of times. Whipple et al (22) based the adequacy of analgesia on the prevalence of a ‘moderate to severe’ pain intensity rating, thus finding 74% of patients did not achieve adequate analgesia. They also based adequacy of pain control on whether pain affected their ability to cough, or if they had trouble breathing or sleeping. If one thing is clear form our and other studies (18,21,22), it is that patients seem to endure pain unnecessarily. As caregivers, we are taught to believe a patient in pain could not have adequate pain control. In contrast, often patients in pain do not seem to connect the fact of being in pain with the notion of inadequate pain control. Instead, they seem more likely to view adequacy pain control in relationship to a sense of satisfaction with their pain control, and perhaps, some unspoken commentary on their desire for medication. Perhaps they believe being in pain to be a necessary, if uncomfortable, component of being a patient and of suffering illness in general.
When RNs and MDs were asked if they felt that patients in pain had overall adequate pain control, both groups responded more affirmatively than patients. We found that RNs were unable to detect inadequate pain control in any of the patients reporting this during matched interviews. MDs in our sample had slightly better detection rates, being 96% sensitive to patients with adequate pain control and 43% specific for patients with inadequate pain control. Whipple et al (22) based their conclusions on caregiver assessment of the adequacy of pain control on the degree of pain reported by their patients. They found 95% of MDs and 81% of RNs reported adequate analgesia when 74% of patients described their pain as moderate to severe.

Our findings, in keeping with those of similar studies (22,41), suggest that both the intensity and prevalence of pain are underestimated by caregivers and that patients may be experiencing inadequate pain control in the ICU. The discrepancy in estimations of numeric pain intensity may be explained partially by the measure itself in that 1) it has never been validated for use in an ICU setting, and 2) it is an arbitrary rating based on subjective and personal concepts of pain. This would not explain, however, the similar fluctuations and trends in ratings among the groups. When given fewer choices of ratings (e.g. choosing a pain descriptor vs. a numeric rating), the degree of difference in responses if less between all three groups. Nonetheless, with regard to RN responses in particular, our study found nurses were less likely to detect pain when patients described it as mild or severe than if patients described their pain as moderate or stated they had no pain (Table 4.2). This raises the possibility that patients in the most severe pain are at an increased risk for having their pain go unnoticed. It also recalls the work of Sanders et al (4), reminding us that patients in severe pain may not offer many behavioral indications at all of their condition, which is in sharp contrast to the notion some caregivers have developed of the patient “writhing in pain.” Indeed, perhaps it is just as probable that severe pain renders patients both speechless and motionless.

Our study did not ask caregivers to explain their decisions to treat patient pain. One might assume that if caregivers were to numerically rate pain higher, they would feel more of an obligation to treat it. However, previous research (17) has indicated that both MD and RN caregivers exhibit hesitation in treating pain out of concerns over medication...
side effects. It is very possible that caregivers in our study also harbored such concerns, but were never asked about them.

None of the previous studies on prevalence of pain in the ICU have interviewed patients after discharge regarding their recall of the ICU. Compared to the ICU pain recall study by Puntillo (13), fewer patients in our study (68%) recalled their ICU stay, however, patients in that study were interviewed a mean of 2.5 days post-discharge, and always within five days of discharge. Patients in our study were interviewed a median of 5 days (IQR 4-7) days post-discharge. Patients were often interviewed on two occasions post-discharge, which may have introduced more variation in responses than if the interview was capped at one time.

Patients studied by Puntillo also exhibited better recall of ICU pain, reporting a pain prevalence of 71% through recall of their ICU pain. Our patients reported a prevalence of 57% through recall. When matching patients interviews completed in the ICU and at follow-up, accurate recall of ICU pain increased to 71% (of 21 patients). During follow-up interviews patients rated their median ICU pain intensity a 6 (IQR 5-8) compared with the overall median pain intensity rating while in the ICU of 6 (4.5-8). Patients in our study described their pain in the ICU as mild, moderate, and severe in equal proportions during follow-up interviews (29% each), which is overall less painful than the finding by Puntillo of 63% rating their pain moderate or severe. Though patients were not asked to qualify what they liked or did not like about their ICU stay, they provided an overall high median numeric rating of 8 (IQR 7-10) and stated they had adequate pain control 90% of the time. This finding tells us that of patients who recall their ICU experience, they report feeling quite positive about it.

**Conclusion**

In summary, the key findings and implications of our study are as follows: 1) that a considerable number of patients in the ICU who are able to communicate are in pain; 2) that the vast majority of patients in pain believe their pain is adequately controlled and an even greater number report having told their caregivers of their pain level; 3) that RNs and MDs show low detection rates of patient pain, consistently rate patient pain intensity lower than their patients, and rarely know when patient pain is inadequately
controlled; 4) that the majority of patients who recall their ICU experience also recall ICU pain; and 5) that patients rated their overall ICU experience highly regardless of their ICU pain experience. The reasons and hypotheses behind these findings comprise a small segment of the vast domain of future research on this subject.
Tables and Figures
<table>
<thead>
<tr>
<th>Variable</th>
<th>Enrolled Patients (n=129)</th>
</tr>
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<tbody>
<tr>
<td><strong>Patient Characteristics</strong></td>
<td></td>
</tr>
<tr>
<td>Median Age (IQR)</td>
<td>70 (55-78)</td>
</tr>
<tr>
<td>Male Sex (%)</td>
<td>71 (55%)</td>
</tr>
<tr>
<td><strong>Ethnicity (%)</strong></td>
<td></td>
</tr>
<tr>
<td>White, non-Hispanic</td>
<td>97 (75%)</td>
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<tr>
<td>Black, non-Hispanic</td>
<td>25 (19%)</td>
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<tr>
<td>Hispanic</td>
<td>7 (5%)</td>
</tr>
<tr>
<td><strong>Medications on Admission</strong></td>
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</tr>
<tr>
<td>Narcotics</td>
<td>14 (11%)</td>
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<tr>
<td>Non-narcotics</td>
<td>22 (17%)</td>
</tr>
<tr>
<td>None</td>
<td>87 (68%)</td>
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<tr>
<td>Other medication</td>
<td>6 (5%)</td>
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Table 1.1
<table>
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<tr>
<th>Clinical Data on MICU Admission</th>
<th>Frequency (%) n=129</th>
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<tbody>
<tr>
<td><strong>Acute</strong>*</td>
<td></td>
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<tr>
<td>Respiratory Failure</td>
<td>78 (62%)</td>
</tr>
<tr>
<td>Pneumonia</td>
<td>53 (42%)</td>
</tr>
<tr>
<td>Sepsis</td>
<td>30 (24%)</td>
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<tr>
<td>Shock</td>
<td>26 (21%)</td>
</tr>
<tr>
<td><strong>Chronic</strong>*</td>
<td></td>
</tr>
<tr>
<td>Heart Disease**</td>
<td>49 (39%)</td>
</tr>
<tr>
<td>Chronic Congestive Heart Failure</td>
<td>18 (14%)</td>
</tr>
<tr>
<td>Cancer</td>
<td>18 (14%)</td>
</tr>
<tr>
<td><strong>SUPPORT Diagnosis</strong>*</td>
<td></td>
</tr>
<tr>
<td>Acute Respiratory Failure*</td>
<td>37 (29%)</td>
</tr>
<tr>
<td>Multi-organ System Failure and Sepsis*</td>
<td>24 (19%)</td>
</tr>
<tr>
<td>Multi-organ System Failure and Malignancy*</td>
<td>12 (9%)</td>
</tr>
<tr>
<td><strong>APACHE II</strong>, median (IQR)</td>
<td>18 (13-23)</td>
</tr>
</tbody>
</table>

Table 1.2
*Patients may have presented with more than one diagnosis.
**Includes patients diagnosed with Coronary Artery Disease, Valvular Heart Disease, and Arrhythmias.

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<table>
<thead>
<tr>
<th>Location</th>
<th>Length of stay, n=129 (Median days, IQR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medical intensive care unit</td>
<td>6 (3-16)</td>
</tr>
<tr>
<td>Hospital</td>
<td>17 (10-35)</td>
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**Table 1.3**

<table>
<thead>
<tr>
<th>Hospital Discharge Location</th>
<th>Frequency, n=129 (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Home</td>
<td>38 (30%)</td>
</tr>
<tr>
<td>Morgue</td>
<td>36 (28%)</td>
</tr>
<tr>
<td>Inpatient Rehabilitation</td>
<td>24 (19%)</td>
</tr>
<tr>
<td>Extended Care Facilities</td>
<td>20 (16%)</td>
</tr>
<tr>
<td>Other*</td>
<td>11 (9%)</td>
</tr>
</tbody>
</table>

**Table 1.4**

* Includes patients discharged to other hospice, other inpatient floors, and assisted living facilities.
<table>
<thead>
<tr>
<th>Study Mortality and Code Status Order</th>
<th>Frequency (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n=129</td>
</tr>
<tr>
<td>Overall Study Mortality</td>
<td></td>
</tr>
<tr>
<td>Deaths occurring in the MICU/Other ICU</td>
<td>36 (38%)</td>
</tr>
<tr>
<td>Deaths occurring in Non-ICU Hospital Setting</td>
<td>24 (67%)</td>
</tr>
<tr>
<td></td>
<td>12 (33%)</td>
</tr>
<tr>
<td>Active Code Status Order</td>
<td>57 (48%)</td>
</tr>
<tr>
<td>Do Not Resuscitate order (DNR)</td>
<td>49 (86%)</td>
</tr>
<tr>
<td>Other order**</td>
<td>8 (14%)</td>
</tr>
</tbody>
</table>

Table 1.5
*Patients with both DNR/DNI, DNI-only, or other specific care orders.*
Figure 2.2
## Table 2.0

* Based on each report of pain and compared to all interviews completed
** Total interviewees with the device
† Based on Mann-Whitney U test

<table>
<thead>
<tr>
<th>Measure/Device</th>
<th>Interviewees With Pain*</th>
<th>Interviewees Without Pain*</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Systolic Blood Pressure</td>
<td>N=102</td>
<td>N=137</td>
<td>0.78†</td>
</tr>
<tr>
<td></td>
<td>Median 125 (IQR 111-140)</td>
<td>Median 123 (IQR 112-141)</td>
<td></td>
</tr>
<tr>
<td>Diastolic Blood Pressure</td>
<td>N=102</td>
<td>N=137</td>
<td>0.94†</td>
</tr>
<tr>
<td></td>
<td>Median 59 (IQR 52-68)</td>
<td>Median 58 (IQ 51-67)</td>
<td></td>
</tr>
<tr>
<td>Heart Rate</td>
<td>N=102</td>
<td>N=137</td>
<td>0.05†</td>
</tr>
<tr>
<td></td>
<td>Median 92 (IQR 75-118)</td>
<td>Median 87 (IQR 75-104)</td>
<td></td>
</tr>
<tr>
<td>Respiratory Rate</td>
<td>N=102</td>
<td>N=136</td>
<td>0.74†</td>
</tr>
<tr>
<td></td>
<td>Median 20 (18-24)</td>
<td>Median 20.5 (IQR 17-24)</td>
<td></td>
</tr>
</tbody>
</table>

## Table 2.1

* Data available on the presence of the device for only a portion of all patients reporting pain
† Based on Chi square testing

<table>
<thead>
<tr>
<th>Measure/Device</th>
<th>Patients In Pain With Device</th>
<th>Patients In Pain Without Device</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oral Endotracheal Tube/Trachosotomy</td>
<td>75%</td>
<td>25%</td>
<td>&lt;0.001†</td>
</tr>
<tr>
<td>(n=51)*</td>
<td>n=38</td>
<td>n=13</td>
<td></td>
</tr>
<tr>
<td>Oral/Nasal Gastric Tube</td>
<td>44%</td>
<td>56%</td>
<td>0.39†</td>
</tr>
<tr>
<td>(n=51)*</td>
<td>n=21</td>
<td>n=27</td>
<td></td>
</tr>
<tr>
<td>Foley catheter (n=115)</td>
<td>38%</td>
<td>62%</td>
<td>0.01†</td>
</tr>
<tr>
<td></td>
<td>n=44</td>
<td>n=71</td>
<td></td>
</tr>
<tr>
<td>Subject</td>
<td>Total #</td>
<td>Reason Not Completed</td>
<td># Not Completed</td>
</tr>
<tr>
<td>---------</td>
<td>---------</td>
<td>----------------------------------------------------------</td>
<td>----------------</td>
</tr>
<tr>
<td>Patients</td>
<td>n=287</td>
<td>Patient Unable to Respond per RN</td>
<td>105</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Patient Unable to Respond per SC*</td>
<td>75</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Patient Asleep</td>
<td>39</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Other**</td>
<td>68</td>
</tr>
<tr>
<td>RNs</td>
<td>n=79</td>
<td>RN On Unit but Not Available</td>
<td>46</td>
</tr>
<tr>
<td></td>
<td></td>
<td>RN Hasn’t Assessed Patient</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Other***</td>
<td>21</td>
</tr>
<tr>
<td>MDs</td>
<td>n=226</td>
<td>MD On Unit but Not Available</td>
<td>107</td>
</tr>
<tr>
<td></td>
<td></td>
<td>MD Off Unit</td>
<td>91</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Reason Unspecified</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td></td>
<td>MD Hasn’t Assessed Patient</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>MD Refused</td>
<td>3</td>
</tr>
</tbody>
</table>

* Study Coordinator
** Includes interviews not completed because the patient was too agitated to participate and instances in which the RN and/or family of the patient did not want the interview conducted.
***Includes interviews not completed because the RN declined participation and other reasons not elaborated.

Table 2.2
### Patient Responses to Pain Questions

<table>
<thead>
<tr>
<th>Question (Total Responses)</th>
<th>All Interviewee Responses</th>
<th>Per Patient Composite Scores</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Are you in pain now? (n=)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>115</td>
<td>43</td>
</tr>
<tr>
<td>No</td>
<td>147</td>
<td>51</td>
</tr>
<tr>
<td><strong>Can you describe your pain now? (n=)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>Mild</td>
<td>47</td>
<td>16</td>
</tr>
<tr>
<td>Moderate</td>
<td>42</td>
<td>17</td>
</tr>
<tr>
<td>Severe</td>
<td>20</td>
<td>9</td>
</tr>
<tr>
<td><strong>Can you rate your pain now? (n=)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Median (IQR)</td>
<td>6 (4-7)</td>
<td>6 (4.5-8)</td>
</tr>
<tr>
<td><strong>Have you reported your pain to RN/MD? (n=)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>87</td>
<td>35</td>
</tr>
<tr>
<td>No</td>
<td>21</td>
<td>6</td>
</tr>
<tr>
<td><strong>Have you received medication for pain? (n=)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>67</td>
<td>25</td>
</tr>
<tr>
<td>No</td>
<td>41</td>
<td>14</td>
</tr>
<tr>
<td>Unsure</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td><strong>Do you have adequate pain control? (n=)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>75</td>
<td>26</td>
</tr>
<tr>
<td>No</td>
<td>27</td>
<td>11</td>
</tr>
<tr>
<td>Unsure</td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>

Table 2.3
## RN Responses to Patient Pain Questions

<table>
<thead>
<tr>
<th>Question (Total Responses)</th>
<th>All Interviewee Responses</th>
<th>Per Patient Composite Scores</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Is the patient in pain now? (n=)</strong></td>
<td>(521)</td>
<td>(115)</td>
</tr>
<tr>
<td>Yes</td>
<td>161</td>
<td>33</td>
</tr>
<tr>
<td>No</td>
<td>332</td>
<td>79</td>
</tr>
<tr>
<td>Unsure</td>
<td>28</td>
<td>3</td>
</tr>
<tr>
<td><strong>Can you describe the patient’s pain now? (n=)</strong></td>
<td>(161)</td>
<td>(33)</td>
</tr>
<tr>
<td>None</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Mild</td>
<td>106</td>
<td>21</td>
</tr>
<tr>
<td>Moderate</td>
<td>48</td>
<td>11</td>
</tr>
<tr>
<td>Severe</td>
<td>5</td>
<td>---</td>
</tr>
<tr>
<td>Unsure</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td><strong>Can you rate the patient’s pain now? (n=)</strong></td>
<td>(157)</td>
<td>(30)</td>
</tr>
<tr>
<td>Median (IQR)</td>
<td>3 (2-5)</td>
<td>3 (2-4)</td>
</tr>
<tr>
<td><strong>Has the patient received medication for pain? (n=)</strong></td>
<td>(160)</td>
<td>(33)</td>
</tr>
<tr>
<td>Yes</td>
<td>102</td>
<td>22</td>
</tr>
<tr>
<td>No</td>
<td>58</td>
<td>11</td>
</tr>
<tr>
<td><strong>Does the patient have adequate pain control? (n=)</strong></td>
<td>(161)</td>
<td>(33)</td>
</tr>
<tr>
<td>Yes</td>
<td>127</td>
<td>30</td>
</tr>
<tr>
<td>No</td>
<td>26</td>
<td>1</td>
</tr>
<tr>
<td>Unsure</td>
<td>8</td>
<td>2</td>
</tr>
</tbody>
</table>

Table 2.4
### MD Responses to Patient Pain Questions

<table>
<thead>
<tr>
<th>Question (Total Responses)</th>
<th>All Interviewee Responses</th>
<th>Per Patient Composite Scores</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Is the patient in pain now? (n=)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>60</td>
<td>24</td>
</tr>
<tr>
<td>No</td>
<td>107</td>
<td>50</td>
</tr>
<tr>
<td>Unsure</td>
<td>47</td>
<td>4</td>
</tr>
<tr>
<td><strong>Can you describe the patient’s pain now? (n=)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Mild</td>
<td>34</td>
<td>13</td>
</tr>
<tr>
<td>Moderate</td>
<td>22</td>
<td>9</td>
</tr>
<tr>
<td>Severe</td>
<td>1</td>
<td>---</td>
</tr>
<tr>
<td>Unsure</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td><strong>Can you rate the patient’s pain now? (n=)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Median (IQR)</td>
<td>3 (2-5)</td>
<td>3 (2-4)</td>
</tr>
<tr>
<td><strong>Has the patient received medication for pain? (n=)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>41</td>
<td>16</td>
</tr>
<tr>
<td>No</td>
<td>11</td>
<td>4</td>
</tr>
<tr>
<td>Unsure</td>
<td>7</td>
<td>3</td>
</tr>
<tr>
<td><strong>Does the patient have adequate pain control? (n=)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>44</td>
<td>18</td>
</tr>
<tr>
<td>No</td>
<td>10</td>
<td>3</td>
</tr>
<tr>
<td>Unsure</td>
<td>5</td>
<td>2</td>
</tr>
</tbody>
</table>

**Table 2.5**
### Patient-RN Matched Responses to Prevalence of Patient Pain

<table>
<thead>
<tr>
<th>Matched Responses to Prevalence of Patient Pain (n=203)</th>
<th>Patient-Yes (n=88)</th>
<th>Patient-No (n=115)</th>
</tr>
</thead>
<tbody>
<tr>
<td>RNs-Yes (n=68)</td>
<td>42</td>
<td>26</td>
</tr>
<tr>
<td>RNs-No (n=135)</td>
<td>46</td>
<td>89</td>
</tr>
</tbody>
</table>

P<0.001, Likelihood ratio 1.9

Table 3.1

### Patient-RN Matched Responses to Adequacy of Patient Pain Control

<table>
<thead>
<tr>
<th>Matched Responses to Adequacy Of Pain Control (n=192)</th>
<th>Patient-Yes (n=169)</th>
<th>Patient-No (n=23)</th>
</tr>
</thead>
<tbody>
<tr>
<td>RNs-Yes (n=183)</td>
<td>160</td>
<td>23</td>
</tr>
<tr>
<td>RNs-No (n=9)</td>
<td>9</td>
<td>0</td>
</tr>
</tbody>
</table>

P<0.897, Likelihood ratio not calculated.

Table 3.2
Patient-MD Matched Responses to Prevalence of Patient Pain

<table>
<thead>
<tr>
<th>Matched Responses to Prevalence of Patient Pain (n=75)</th>
<th>Patient-Yes (n=30)</th>
<th>Patient-No (n=45)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MDs-Yes (n=33)</td>
<td>22</td>
<td>11</td>
</tr>
<tr>
<td>MDs-No (n=42)</td>
<td>8</td>
<td>34</td>
</tr>
</tbody>
</table>

P<0.001, Likelihood ratio 2.7

Table 3.3

Patient-MD Matched Responses to Adequacy of Patient Pain Control

<table>
<thead>
<tr>
<th>Matched Responses to Adequacy Of Pain Control (n=77)</th>
<th>Patient-Yes (n=70)</th>
<th>Patient-No (n=7)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MDs-Yes (n=71)</td>
<td>67</td>
<td>4</td>
</tr>
<tr>
<td>MDs-No (n=6)</td>
<td>3</td>
<td>3</td>
</tr>
</tbody>
</table>

P<0.001, Likelihood ratio 10.0

Table 3.4
### Patient Responses to Follow-Up Questions

<table>
<thead>
<tr>
<th>Question</th>
<th>Composite Patient Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Do you recall your ICU experience? (n=)</strong></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>(62) 42</td>
</tr>
<tr>
<td>No</td>
<td>20</td>
</tr>
<tr>
<td><strong>Do you recall experiencing pain in the ICU? (n=)</strong></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>(42) 24</td>
</tr>
<tr>
<td>No</td>
<td>18</td>
</tr>
<tr>
<td><strong>Can you describe your ICU pain? (n=)</strong></td>
<td></td>
</tr>
<tr>
<td>Did not report</td>
<td>(24) 3</td>
</tr>
<tr>
<td>Mild</td>
<td>7</td>
</tr>
<tr>
<td>Moderate</td>
<td>7</td>
</tr>
<tr>
<td>Severe</td>
<td>7</td>
</tr>
<tr>
<td><strong>Can you rate your ICU pain? (n=)</strong></td>
<td>(22) 6 (5-8)</td>
</tr>
<tr>
<td><strong>Do you recall being treated for pain in the ICU? (n=)</strong></td>
<td>(42) 17</td>
</tr>
<tr>
<td>Yes</td>
<td>25</td>
</tr>
<tr>
<td>No</td>
<td></td>
</tr>
<tr>
<td><strong>Did you receive adequate pain control in the ICU?</strong></td>
<td>(31) 28</td>
</tr>
<tr>
<td>Yes</td>
<td>3</td>
</tr>
<tr>
<td>No</td>
<td></td>
</tr>
<tr>
<td><strong>How do you rate your overall ICU experience?</strong></td>
<td>(40) 8 (7-10)</td>
</tr>
<tr>
<td>Median (IQR)</td>
<td></td>
</tr>
</tbody>
</table>

Table 2.5
Patient-Patient Matched ICU and Follow-Up Interviews

Patient-Patient Matched: Prevalence of Pain

<table>
<thead>
<tr>
<th>Matched Responses to Prevalence Of Pain Control (n=38)</th>
<th>ICU-Yes (n=23)</th>
<th>ICU-No (n=15)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Follow-Up-Yes (n=21)</td>
<td>15</td>
<td>6</td>
</tr>
<tr>
<td>Follow-Up-No (n=17)</td>
<td>8</td>
<td>9</td>
</tr>
</tbody>
</table>

P=0.026, Likelihood ratio 1.63

Table 3.6

Patient-Patient Matched: Adequacy of Pain Control

<table>
<thead>
<tr>
<th>Matched Responses to Adequacy Of Pain Control (n=25)</th>
<th>ICU-Yes (n=20)</th>
<th>ICU-No (n=5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Follow-Up-Yes (n=24)</td>
<td>19</td>
<td>5</td>
</tr>
<tr>
<td>Follow-Up-No (n=1)</td>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>

P=0.6, Likelihood ratio not calculated, specificity=0

Table 3.7

Patient-Patient Matched: Received Pain Treatment

<table>
<thead>
<tr>
<th>Matched Responses to Receiving Pain Medication (n=34)</th>
<th>ICU-Yes (n=16)</th>
<th>ICU-No (n=18)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Follow-Up-Yes (n=15)</td>
<td>12</td>
<td>3</td>
</tr>
<tr>
<td>Follow-Up-No (n=19)</td>
<td>4</td>
<td>15</td>
</tr>
</tbody>
</table>

P=0.001, Likelihood ratio 4.5

Table 3.8

Patient-Patient Matched: Pain Description

<table>
<thead>
<tr>
<th>Matched Responses to Pain Descriptions (n=30)</th>
<th>ICU-None (n=9)</th>
<th>ICU-Mild (n=10)</th>
<th>ICU-Moderate (n=7)</th>
<th>ICU-Severe (n=4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Follow-Up-None (n=8)</td>
<td>4</td>
<td>3</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Follow-Up-Mild (n=7)</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Follow-Up-Moderate (n=8)</td>
<td>1</td>
<td>2</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>Follow-Up-Severe (n=7)</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>

P<0.34

Table 3.9
Patient Median Pain Rating By Pain Descriptor

<table>
<thead>
<tr>
<th>Pain Description?</th>
<th>Median Pain Rating (IQR)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mild</td>
<td>4 (4-5.5)</td>
<td>P=0.03</td>
</tr>
<tr>
<td>Moderate</td>
<td>6 (6-7)</td>
<td>P=0.03</td>
</tr>
<tr>
<td>Severe</td>
<td>8 (7.5-9)</td>
<td>P=0.03</td>
</tr>
</tbody>
</table>

Table 4.1
### Patient-RN Matched Pain Descriptions

<table>
<thead>
<tr>
<th>Patient Pain Description</th>
<th>RN Pain Description</th>
<th>None</th>
<th>Mild</th>
<th>Moderate</th>
<th>Severe</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>None</td>
<td>71</td>
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<td>Severe</td>
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P<0.001

*Table 4.2*
All Patients: Pain Intensity and Description

Spearman's rho correlation coefficient 0.9, p=0.01

Figure 4.1
Patients in Pain: Intensity and Description

Spearman's rho correlation coefficient 0.6, p=0.01

Figure 4.2
REFERENCES


25. Pasero C, McCaffery M. Pain in the Critically Ill: New information reveals that one of the simplest procedures—turning—can be the most painful one. Am J Nurs 2002; 102(1):59-60


42. Flaherty GG, Fitzpatrick JJ. Relaxation technique to increase comfort level of post-operative patients. Nurs Res 1978;27:352-55


APPENDIX A
Hi, Mr./Ms. _______________. My name is __________________. We are conducting a research study on pain among patients in the Medical ICU.

If you would like to participate, I will ask you a few questions. We are interested in finding out if you are feeling pain and how severe it is, if so. We may be asking you some other questions regarding how you are feeling in general as a point of reference. We will ask you these questions each day of your Medical ICU stay around this same time. If you remain hospitalized, we will also ask you some follow-up questions 3 and 7 days after you are discharged from the Medical ICU. Each time it should take about 5 minutes. In addition, we will be reviewing parts of your medical record to collect information on your illness and treatments. We also are asking the physicians and nurses caring for you about your pain in the Medical ICU. All of your responses will be kept confidential. That means that no one will know how you respond to my questions unless you want them to. You will be identified to us through a unique study number. The table associating you to this number, as well as the data we collect from you, will be maintained in password-protected computer files and paper files in a locked office.

You have the right to refuse participation in this study at any time. Your refusal to participate will not affect your ongoing Medical ICU care or your relationship with your Physician or Yale-New Haven Hospital in any way.

If you decide to participate in the study, we will compare yours and others’ responses to these simple questions for their similarities and differences. We would like to develop a better understanding of when patients feel pain in the Medical ICU in an effort to prevent and relieve pain more quickly. Although you may not personally benefit from this study your participation may help future patients like you who may be suffering from pain.

THIS FORM IS NOT VALID UNLESS THE FOLLOWING BOX HAS BEEN COMPLETED IN THE HIC OFFICE

| THIS FORM IS VALID ONLY UNTIL: |  
| HIC PROTOCOL #: |  
| INITIALED: |  

General Pain Rating Score

Check Status of Subject being Interviewed:  
_____ patient  
_____ nurse  
_____ physician

Date Administered: ___/___/____  Time Administered: ___________  Administered by: _______________________

Complete appropriate identifier for subject being interviewed:

Patient study #_________ and Patient initials____________  
or  
Nurse ID ______________ (initials and month/day of birth)  
or  
Physician ID ______________ (initials and month/day of birth)

I am going to ask you to rate four different experiences using the 0-10 pain scale to get a general idea of how you interpret pain. (If you think you have answered these pain rating questions previously, please let me know. We only need to obtain this score on you once):

Please choose a number from 0 to 10 that best describes the level of pain you associate with the following experience. 0 means ‘no pain’ and 10 means ‘the worst possible pain’. If you prefer, you can choose one of the faces on the bottom row. The happy face means ‘no pain’ and the sad face means ‘the worst possible pain’.

1. A feather brushing over your foot?  
   _______ (specific number)  
   _______ I can’t answer  
   _______ asked, but did not respond  
   _______ missing

2. Breaking your index finger?  
   _______ (specific number)  
   _______ I can’t answer  
   _______ asked, but did not respond  
   _______ missing

3. Having your leg amputated (cut off) without anesthesia?  
   _______ (specific number)  
   _______ I can’t answer  
   _______ asked, but did not respond  
   _______ missing

4. Receiving a flu shot in your arm?  
   _______ (specific number)  
   _______ I can’t answer  
   _______ asked, but did not respond  
   _______ missing
Entry Sheet

(Complete only if patients has been in an ICU at least 24 hours)

Patient’s Study Number: ______________________
Patient’s Initials: _____________________________
Date: ___________________ Completed By: ____________________

1. Sex: _____ male  _____ female

2. Date of Birth: __/__/____

3. Age: __________

4. Race/Ethnicity:  _________ White, non-Hispanic
                  _________ Black, non-Hispanic
                  _________ Hispanic
                  _________ Asian
                  _________ Other (_____________________)  
                  _________ Unknown

5. Pain Medications Taken Actively at the Time of Admission to hospital (For products containing acetaminophen and codeine (Tylenol #3, Tylenol #4) please check Tylenol and Codeine):

   ___ Fentanyl (duragesic patch)
   ___ Morphine (MSIR, MSContin, MSO4)
   ___ Tylenol (acetominophen)
   ___ Codeine
   ___ Oxycodone (Oxycontin, Percocet, Percodan)
   ___ Demerol (meperidine)
   ___ NSAID (e.g., Motrin, ibuprofen, Vioxx, Celebrex, Naproxyn, ASA (aspirin) > 325 mg/day)
   ___ Other (___________________________________________________________________)
   ___ None

6. Check all of the acute conditions the patient had on admission to the ICU  (If it not documented at time of admission, but determined later that patient had the condition at the time of admission, it should still be recorded as present at time of ICU admission; if subsequent analysis reveals that the initial diagnosis was incorrect, then the response should be changed:

   ___ Respiratory Failure (On ventilator or requiring Bi-PaP)
   ___ Pneumonia (As recorded in the chart)
   ___ Asthma exacerbation (As recorded in the chart)
   ___ COPD exacerbation (As recorded in the chart)
   ___ DKA (As recorded in the chart)
   ___ HHNK (Severe hyperglycemia requiring admission, do not check if DKA)
   ___ Drug Overdose (As documented in the chart)
   ___ Pulmonary Embolism (As documented in the chart)
   ___ Stroke (As documented in the chart)
   ___ Liver Failure (Hepatic encephalopathy, shock liver, or as documented in the chart)
   ___ s/p Cardiac arrest (admission to the ICU after a code)
   ___ Myocardial infarction (elevated troponin with EKG changes documented)
   ___ CHF (as documented in the chart)
   ___ GI Bleed (Requiring transfusions or acute endoscopy within 24 hours of ICU admission)
   ___ Sepsis (SIRS criteria and antibiotics to treat an infection)
   ___ Shock (Hypotension, MAP < 60, use of vasopressors)
   ___ Acute Renal Failure (Requiring dialysis and/or oliguria (< 30 cc/hr, anuria)
   ___ Acute Pancreatitis (As recorded in chart)
   ___ Metabolic acidosis (pH <7.3 with HCO3 < 18 or lactate > upper limit of normal)
   ___ Other major diagnosis: _____________________________________________
   ___ None
7. Check all of the chronic conditions the patient had on admission to the ICU. (If it was not documented at time of admission, but determined later that patient had the condition at the time of admission, it should still be recorded as present at time of ICU admission; if subsequent analysis reveals that the initial diagnosis was incorrect, then the response should be changed):

- CAD
- CHF
- COPD
- Chronic Renal Failure (on chronic dialysis)
- Decubitus Ulcer (as recorded in chart)
- Cancer (Do not include skin cancers other than melanoma. Must be an active cancer)
- Dementia (as recorded in the chart)
- AIDS (as recorded in the chart)
- Arthritis (Actively requiring treatment with anti-inflammatory/pain med on admission to ICU)
- Other major diagnoses:
- None

8. Does this patient have any of the following SUPPORT diagnoses indicative of a ≥ 50% mortality rate (Calculate based on first 24 hours in the ICU. If patient has more than one ICU admission for the same hospital admission, use the current ICU admission. If patient was not placed in the MICU during the first 24 hours, use information recorded from the appropriate ICU. If it was not documented, but determined later that patient had the condition within 24 of admission, it should still be recorded as present):

- Nontraumatic coma
- Multiple organ system failure and malignancy
- Acute Respiratory Failure
- Multiple organ system failure and sepsis
- Acute exacerbation of severe COPD
- Acute exacerbation of severe CHF
- Chronic liver disease
- Colon cancer with liver metastases
- Non-small cell carcinoma
- None

9. Apache II score (Calculate based on first 24 hours in the ICU. If patient has more than one ICU admission for the same hospital admission, use the current ICU admission. If patient was not placed in the MICU during the first 24 hours, calculate score based upon information recorded from the appropriate ICU): ____

10. Date of Admission to Hospital: ___/___/____

11. Date of Admission to MICU: ___/___/____
Formulas:

Mean Arterial Blood Pressure: \[ \frac{(2 \times \text{diastolic BP}) + \text{systolic BP}}{3} \]

Temperature in Celsius: \( T_c = \frac{5}{9} \times (T_f - 32) \)

Temperature in Fahrenheit: \( T_f = \left( ^\circ C \times \frac{9}{5} \right) + 32 \)

Alveolar – arterial Gradient:

\[ A\text{-aDO}_2 = (\text{FiO}_2 \text{ (as decimal)} \times 713) - \text{PaCO}_2 - \text{PaO}_2 \]

(Only calculate on patients who are intubated and FiO2 ≥ 50%)

\[ \text{FiO}_2 = \text{fraction of inspired oxygen} \]

### Device

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<th>Device</th>
<th>Oxygen Flow Rate (L/min)</th>
<th>FiO2</th>
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Systemic Inflammatory Responses to Infection (SIRS) Criteria:

1) Core Temperature ≥ 38°C (100.4°F) or ≤ 36°C (96.8°F)
2) Tachycardia ≥ 90 beats/minute, except in patients with a medical condition known to increase the heart rate or those receiving treatment that would prevent tachycardia
3) Respiratory Rate ≥ 20 breaths/minute or PaCO2 ≤ 32 mmHg
4) White blood count ≥ 12 x 10^9/l ≤ 4 x 10^9/l or > 10% immature (band; neutrophil) forms
# Patient Daily Assessment Sheet

Patient Study Number: __________________
Patient Initials: _______________________
Date: __________________ Time: __________ Completed By: __________________
Attending M.D.: _______________________

1. **Pain Medications Patient Actively Receiving:**
   - _____ Fentanyl (within the past 1 hour)
   - _____ Morphine (within the past 4 hours)
   - _____ Other (specify: ______________________)
   - _____ None

2. **Pain Medications Patient Received during the previous calendar day (00:01 to 24:00):**
   - _____ Fentanyl
   - _____ Morphine
   - _____ Other (specify: ______________________)
   - _____ None

3. **Sedatives Patient Actively Receiving:**
   - _____ Ativan (within the past 6 hours)
   - _____ Versed (within the past 1 hour)
   - _____ Propofol (within the past half hour)
   - _____ Haldol (within the past 6 hours)
   - _____ Other (specify: ______________________)
   - _____ None

4. **Sedatives Patient Received during the previous calendar day (00:01 to 24:00):**
   - _____ Ativan
   - _____ Versed
   - _____ Propofol
   - _____ Haldol
   - _____ Other (specify: ______________________)
   - _____ None

5. **Neuromuscular blockers via a continuous drip or within 2 hours. Patient receiving:**
   - _____ Vecuronium
   - _____ Cisatracurium
   - _____ Pancuronium
   - _____ Other (specify: ______________________)
   - _____ None

6. **Neuromuscular blockers via a continuous drip or intermittent boluses Patient received during the previous calendar day (00:01 to 24:00):**
   - _____ Vecuronium
   - _____ Cisatracurium
   - _____ Pancuronium
   - _____ Other (specify: ______________________)
   - _____ None
Patient Daily Assessment Sheet

Patient Study Number: ____________________________
Patient Initials: ________________________________
Date: ___________________ Time: __________ Completed By: ____________________
Attending M.D. ____________________________________________________________

7. Vasopressors/inotropics patient receiving currently
   _____ dopamine
   _____ dobutamine
   _____ vasopressin
   _____ levophed
   _____ neosynephrine
   _____ epinephrine
   _____ other (specify___________)
   _____ none

8. Vasopressors/inotropics patient received during the previous calendar day (00:01 to 24:00)
   _____ dopamine
   _____ dobutamine
   _____ vasopressin
   _____ levophed
   _____ neosynephrine
   _____ epinephrine
   _____ other (specify___________)
   _____ none

9. Please check if the patient currently has this invasive device and specify location:
   _____ Endo-tracheal Tube (If checked, please specify location)
       _____ nasal
       _____ oral
       _____ trachostomy
   _____ Naso-Gastric tube (If checked, please specify location)
       _____ oral
       _____ nasal
   _____ Foley Catheter
   _____ Oxygen supplementation
       _____ Nasal cannula
       _____ Face mask
       _____ Other
   _____ Central Venous Line (If checked, please specify location; if patient has more than 1 catheter specify both and describe in comments; check Swan if central line is also a Swan)
       _____ subclavian
       _____ jugular
       _____ femorol
       _____ PICC (Peripheral Inserted Central Venous Catheter line)
   _____ Swan Ganz
   _____ Arterial line (If checked, please specify location)
       _____ Radial
       _____ Femoral
       _____ Other: (______________________________)
   _____ Mechanical ventilation
       _____ Tube
       _____ BiPAP
   _____ other (specify #1: ______________________________)
       (specify #2: ______________________________)
       (specify #3: ______________________________)
Patient Daily Assessment Sheet

Patient Study Number: ____________________________
Patient Initials: ________________________________
Date: ___________________ Time: __________ Completed By: ____________________
Attending M.D.: ________________________________

10. Please check if the patient has had this invasive device in the last 24 hours (calendar date 00:00-24:00) and specify location:
   _____ Endo-tracheal Tube (If checked, please specify location)
       _____ nasal
       _____ oral
       _____ tracheostomy
   _____ Naso-Gastric tube (If checked, please specify location)
       _____ oral
       _____ nasal
   _____ Foley Catheter
   _____ Oxygen supplementation
       _____ Nasal cannula
       _____ Face mask
       _____ Other
   _____ Central Venous Line (If checked, please specify location; if patient has more than 1 catheter specify both and describe in comments; check Swan if central line is also a Swan)
       _____ subclavian
       _____ jugular
       _____ femoral
       _____ PICC (Peripheral Inserted Central Venous Catheter line)
   _____ Swan Ganz
       _____ Arterial line (If checked, please specify location)
       _____ Radial
       _____ Femoral
       _____ Other: ____________________________
   _____ Mechanical ventilation
       _____ Tube
       _____ BiPAP
       _____ other (specify #1: ________________________)
         (specify #2: ________________________)
         (specify #3: ________________________)

12. Most recent Vital Signs recorded on Flow Sheet:
   a. temperature
   b. blood pressure
   c. pulse
   d. respiratory rate
   e. oxygen saturation (pulse oximetry)

13. Pain score within 24 hours? ___Y ___N
14. Hours since last pain score: ______
15. Last pain score:
16. Ramsay within 24 hours? ___Y ___N
17. Hours since last Ramsay: ______
18. Most recent Ramsay:
19. Did physician(s) document pain in their progress note? _____ Y _____ N
**Patient’s Daily Alertness/Pain Assessment Sheet**

Patient Study Number: ______________________
Patient Initials: ___________________________
Date: ___________________ Time:  __________
Completed By: ___________________________

Able to complete: _____(yes) _____(no)
If unable to complete, please specific why: _____ patient off unit
_____ patient on unit but unavailable/procedure performed in room
_____ data collector found patient too sedated/not capable of responding
_____ patient’s nurse indicated patient sedated/not capable of responding
_____ patient did not want to participate
_____ patient sleeping
_____ other (_____________________________________________

**Alertness Assessment**

1. Circle Richmond Agitation Sedation Scale Score upon arrival in the room:
   a. Combative, violent, immediate danger to staff
   b. Pulls or removes tubes or catheters; aggressive
   c. Frequent non-purposeful movement; fights ventilator
   d. Anxious, apprehensive but movements non-aggressive or vigorous
   e. Fully alert with no signs of lethargy

If not awake, state patient’s name and say to open eyes and look at speaker. Physically stimulate patient by shaking
shoulder and/or rubbing sternum (or if patient is awake but displays the following)...

f. If patient awakens and sustains eye opening and contact
   g. If patient awakens with eye opening and eye contact but not sustained
   h. If patient does not awaken, but has eye opening or movement in response to
      Voice
   i. If there is no response to voice but some response (movement) to physical
      Stimulation
   j. There is no response to voice or physical stimulation

2. Is patient able to wiggle toes upon request?  _____ yes  _____ no
3. Is patient able to blink their eyes upon request?  _____ yes  _____ no

**Pain Assessment**

I am now going to ask you several questions about your level of pain right now and the
general level of pain you have experienced during the past 8 hours. The first series of
questions deal with the level of pain you have right now, and the second series deal with
the average level of pain you have experienced over the past 8 hours.

4. Do you have any pain right now?  _____ yes  _____ no
   _____ asked question, but no answer
   _____ missing

5. Would you describe your current level of pain as no pain, mild pain, moderate pain, or severe pain?
   _____ no pain
   _____ mild pain
   _____ moderate pain
   _____ severe pain
   _____ asked question, but no answer
   _____ missing

6. Can you describe your level of pain right now using the following scale that numbers from 0 to 10?
   _____ yes
   _____ no
   _____ asked question, but no answer
   _____ missing
Patient’s Daily Alertness/Pain Assessment Sheet

Patient Study Number: ____________________
Patient Initials: __________________________
Date: ___________________ Time: __________ Completed By: ___________________________

7. (Ask if patient answered ‘yes’ to question #4) Please choose a number from 0 to 10 that best describes the level of pain you are experiencing right now. 0 means ‘no pain’ and 10 means ‘the worst possible pain’. If you prefer, you can choose one of the faces on the bottom row. The happy face means ‘no pain’ and the sad face means ‘the worst possible pain’.
   ___ # specified
   ___ asked, no answer
   ___ missing

8. (Ask of patient answered ‘no’ to question #4) Please specify why you cannot describe your pain using this scale.

9. How does this level of pain compare to the level of pain you were feeling yesterday?
   a. More/Worse than yesterday  ___
   b. About the same as Yesterday ___
   c. Less/Better than Yesterday ___
   d. I Can’t Remember ___
   e. I didn’t have pain today or yesterday ___
   f. Asked, no answer ___
   g. Missing ___

10. Have you told your nurse/doctor about the level of pain you are experiencing right now? ___ yes
    ___ no
    ___ asked, no answer
    ___ missing
    ___ not applicable

11. Has the nurse/doctor given you medication for the pain you are having right now? ___ yes
    ___ no
    ___ unsure
    ___ asked, no answer
    ___ missing

12. Do you think you have been receiving adequate pain control (enough pain medicine) right now? ___ yes
    ___ no
    ___ asked, no answer
    ___ missing

13. Have you had any pain during the past 8 hours? ___ yes
    ___ no
    ___ asked, no answer
    ___ missing

14. Would you describe your average level of pain during the past 8 hours as no pain, mild pain, moderate pain, or severe pain?
    ___ no pain
    ___ mild pain
    ___ moderate pain
    ___ severe pain
    ___ asked question, no answer
    ___ missing

15. Can you describe the general level of pain you have experienced during the past 8 hours using the following scale that numbers from 0 to 10? ___ yes
    ___ no
    ___ asked question, but patient did not answer
    ___ missing

16. (Ask if patient answered ‘yes’ to question #5) Please choose a number from 0 to 10 that best describes the general level of pain you have experienced during the past 8 hours. 0 means ‘no pain’ and 10 means ‘the worst possible pain’. If you prefer, you can choose one of the faces on the bottom row. The happy face means ‘no pain’ and the sad face means ‘the worst possible pain’. ___ # specified
    ___ asked, no answer
Patient’s Daily Alertness/Pain Assessment Sheet

Patient Study Number: ______________________
Patient Initials: ___________________________
Date: ___________________ Time: __________ Completed By: ___________________________

17. (Ask of patient answered ‘no’ to question #15) Please specify why you cannot describe your pain using this scale.

18. How does this level of pain compare to the level of pain you were feeling yesterday?
   a. More/Worse than yesterday ______
   b. About the same as Yesterday ______
   c. Less/Better than Yesterday ______
   d. I Can’t Remember ______
   e. I didn’t have pain today or yesterday ______
   f. Unsure ______
   g. Asked, no answer ______
   h. Missing ______

19. Have you told your nurse/doctor about the level of pain you are experiencing during the past 8 hours?
   ______ yes
   ______ no
   ______ asked, can’t answer
   ______ missing
   ______ not applicable

20. Has the nurse/doctor given you medication for pain during the past 8 hours?
   ______ yes
   ______ no
   ______ unsure
   ______ asked, no answer
   ______ missing

21. Do you think you have been receiving adequate pain control (enough pain medicine) during the past 8 hours?
   ______ yes
   ______ no
   ______ asked, no answer
   ______ missing
Patient’s Follow-up Alertness/Pain Assessment Sheet

Patient Study Number: ____________________
Patient Initials: _____________________________

# of Days since patient discharged from ICU: ___ (Attempt to interview subjects 3 days and 1 week after they were discharged from the ICU)

Date: ___________________ Time:  __________ Completed By: ___________________________

If unable to complete, please specific why: ________________________________

- patient off unit
- patient on unit but unavailable/procedure performed in room
- data collector found patient too sedated/not capable of responding
- patient’s nurse indicated patient sedated/not capable of responding
- patient did not want to participate
- patient sleeping
- other (_____________________________________________)

Alertness Assessment

3. Circle Richmond Agitation Sedation Scale Score upon arrival in the room:
   a. Combative, violent, immediate danger to staff
      Combative  +4
   b. Pulls or removes tubes or catheters; aggressive
      Very Agitated +3
   c. Frequent non-purposeful movement; fights ventilator
      Agitated   +2
   d. Anxious, apprehensive but movements non-aggressive or vigorous
      Restless   +1
   e. Fully alert with no signs of lethargy
      Alert and Calm 0

   If not awake, state patient’s name and say to open eyes and look at speaker. Physically stimulate patient by shaking shoulder and/or rubbing sternum (or if patient is awake but displays the following)...

   f. If patient awakens and sustains eye opening and contact
      Drowsy   -1
   g. If patient awakens with eye opening and eye contact but not sustained
      Light Sedation -2
   h. If patient does not awaken, but has eye opening or movement in response to Voice
      Moderate Sedation -3
   i. If there is no response to voice but some response (movement) to physical Stimulation
      Deep Sedation -4
   j. There is no response to voice or physical stimulation
      Unarousable -5

4. Is patient able to wiggle toes upon request? _____ yes _____ no
3. Is patient able to blink their eyes upon request? _____ yes _____ no

Recall of Pain from ICU

5. Do you recall being in the Intensive Care Unit (ICU)?
   _____ yes
   _____ no
   _____ asked question, can’t answer
   _____ missing

5. (Ask if answered yes to #4) Do you recall having pain while you were in the Intensive Care Unit (ICU)?
   _____ yes
   _____ no
   _____ not applicable (Check if answered no to #4)
   _____ asked question, can’t answer
   _____ missing

6. (Ask if answered yes to #5) Would you describe your general level of pain in the ICU as no pain, mild pain, moderate pain, or severe pain?
   _____ no pain
   _____ mild pain
   _____ moderate pain
   _____ severe pain
   _____ not applicable (Check if answered no to #4)
   _____ asked question, can’t answer
   _____ missing
Patient’s Follow-up Alertness/Pain Assessment Sheet

Patient Study Number: ____________________________
Patient Initials: ________________________________

# of Days since patient discharged from MICU: ___ (Attempt to interview subjects 3 days and 1 week after they were discharged from the MICU)

Date: ___________________ Time: __________ Completed By: ____________________________

7. (Ask if answered yes to #5) Can you describe what your general level of pain was while in the ICU using the following scale that numbers from 0 to 10?

   _____ yes
   _____ no
   _____ not applicable (check if answered no to #4)
   _____ asked, can’t answer
   _____ missing

8. (Ask if answered yes to #5) Please choose a number from 0 to 10 that best describes the average level of pain you feel you experienced while in the Intensive Care Unit (ICU). 0 means ‘no pain’ and 10 means ‘the worst possible pain’.  If you prefer, you can choose one of the faces on the bottom row. The happy face means ‘no pain’ and the sad face means ‘the worst possible pain’.

   _____ (# specified)
   _____ not applicable (Check if answered no to #4)
   _____ asked, can’t answer
   _____ missing

9. (Ask if answered yes to #4) Do you remember being asked about pain while in the Intensive Care Unit (ICU)?

   _____ yes
   _____ no
   _____ not applicable (Check if answered no to #4)
   _____ asked, can’t answer
   _____ missing

8. (Ask if answered yes to #4) Do you remember being treated for pain while in the Intensive Care Unit (ICU)?

   _____ yes
   _____ no
   _____ not applicable (Check if answered no to #4)
   _____ asked, can’t answer
   _____ missing

11. (Ask if answered yes to #8) Do you feel that your pain was treated adequately while you were in the Intensive Care Unit (ICU)?

   _____ yes
   _____ no
   _____ not applicable (Check if answered no to #8)
   _____ asked, can’t answer
   _____ missing

12. (Ask if answered yes to #4) How would you rate your overall experience in the Intensive Care Unit (ICU)? Please choose a number from 0 to 10 that best describes your experience in the Intensive Care Unit (ICU). 0 means ‘worst possible experience’ and 10 means ‘the best possible experience’.

   _____ (# specified)
   _____ not applicable (Check if answered no to #4)
   _____ asked, can’t answer
   _____ missing
Discharge Sheet

Patient’s Study Number: ______________________
Patient’s Initials: _____________________________

Date: ___________________ Completed By: ____________________

1. Date of Discharge from MICU: _ _/ _ _/ _ _

2. Date of Discharge from Hospital: _ _/ _ _/ _ _

3. Status at Discharge from Hospital:
   — Alive
   — Dead

4. Disposition at Discharge from Hospital:
   — home
   — hospice
   — assisted living
   — extended care facility
   — in-patient care facility
   — morgue
   — other: _______________________________________

5. If patient died while in the hospital, please indicate location at time of death:
   — death occurred while in MICU
   — patient had been transferred out of MICU, but death occurred in another ICU of YNHH
   — death occurred in non-ICU setting of YNHH
   — not applicable/patient alive at time of discharge

6. Did Patient have a code status order at anytime during hospitalization?     _____ yes  ____ no
   If yes:
   Date of #1 code status order: _________________
   Goal of #1 code status order: _________________ (cure, maintenance, or comfort)
   #1 Resuscitation status: ______________________
   #1 Additional limits to treatment: __________________________________________

   If yes:
   Date of #2 code status order: _________________
   Goal of #2 code status order: _________________ (cure, maintenance, or comfort)
   #2 Resuscitation status: ______________________
   #2 Additional limits to treatment: __________________________________________

   If yes:
   Date of #3 code status order: _________________
   Goal of #3 code status order: _________________ (cure, maintenance, or comfort)
   #3 Resuscitation status: ______________________
   #3 Additional limits to treatment: __________________________________________

   If yes:
   Date of #4 code status order: _________________
   Goal of #4 code status order: _________________ (cure, maintenance, or comfort)
   #41 Resuscitation status: ______________________
   #4 Additional limits to treatment: __________________________________________
Nurse’s Daily Pain Assessment Sheet

Patient Study Number: ______________________  Nurse’s ID Number: ______________________
Patient Initials: ___________________________  (initials/month and day of birth)
Date: ___________________  Time: __________  Completed By: ___________________________
Able to complete: ____(yes) _____(no)
If unable to complete, please specify why:  nurse off unit
_____ nurse on unit but unavailable
_____ nurse did not want to participate
_____ nurse recently came on shift and hasn’t assessed patient
_____ other (specify: __________________________________)
__ __ __ __ __  N / A

Pain Assessment

1. Do you think this patient is experiencing pain today?  yes
   no
   unsure
   missing

2a. (Ask if answered yes to question #1) Please explain how you know this patient is experiencing pain today. Some explanations previously described, which may apply to this patient, include:
   patient told me
   facial grimacing
   vital signs changes
   tearing
   diaphoresis
   localizes pain (agitated with activity)
   (other: __________________________________________)

2b. (Ask if answered no to question #1) Please explain how you know this patient is not experiencing pain today. Some explanations previously described, which may apply to this patient, include:
   patient denies pain
   lack of facial grimacing
   no vital sign changes
   lack of tearing
   lack of diaphoresis
   does not localize pain (does not appear agitated with activity)
   (other: __________________________________________)

Now I am going to ask you several questions about this patient’s level of pain right now and their general level of pain during the past 8 hours. The first series of questions deal with the level of pain you think the patient is having right now.

3. Do you think this patient has any pain right now?  yes
   no
   unsure
   missing

4. Would you describe the patient’s current level of pain as no pain, mild pain, moderate pain, or severe pain?
   no pain
   mild pain
   moderate pain
   severe pain
   unsure
   missing

5. Can you describe the patient’s current level of pain using the following scale that numbers from 0 to 10?
   yes
   no
   missing
**Nurse's Daily Pain Assessment Sheet**

Patient Study Number: ____________________  Nurse's ID Number: ________________________  (initials/month and day of birth)

Patient Initials: ___________________________  (initials/month and day of birth)

Date: ___________________  Time:  __________  Completed By: ___________________________

6. (Ask if the nurse answered ‘yes’ to questions #5) Please choose a **number** from 0 to 10 that best describes the level of pain you believe he/she is experiencing right now. 0 means ‘no pain’ and 10 means ‘the worst possible pain’. If you prefer, you can choose one of the faces on the bottom row. The happy face means ‘no pain’ and the sad face means ‘the worst possible pain’.

___________  (specify the #)
___________  missing

7. (Ask if the nurse answered ‘no’ or ‘<4’ to questions #5) Please specify why you cannot describe the patient’s pain using this scale.

8. Has the patient received medication for the pain you think they are experiencing right now?  

<table>
<thead>
<tr>
<th></th>
<th>yes</th>
<th>no</th>
<th>unsure</th>
<th>not applicable</th>
<th>missing</th>
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<td></td>
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</table>

9. Do you think the patient is receiving adequate pain control (enough pain medications to control their pain) right now?  

<table>
<thead>
<tr>
<th></th>
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</table>

Now I am going to ask you some questions that deal with the level of pain you think the patient experienced over the past 8 hours.

10. Do you think this patient has had any pain over the past 8 hours?  

<table>
<thead>
<tr>
<th></th>
<th>yes</th>
<th>no</th>
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</table>

11. Would you describe the patient’s average level of pain over the past 8 hours as no pain, mild pain, moderate pain, or severe pain?  

<table>
<thead>
<tr>
<th></th>
<th>no pain</th>
<th>mild pain</th>
<th>moderate pain</th>
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12. Can you describe the average level of pain you think the patient has experienced over the past 8 hours using the following scale that numbers from 0 to 10?  

<table>
<thead>
<tr>
<th></th>
<th>yes</th>
<th>no</th>
<th>missing</th>
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</table>

13. (Ask if the nurse answered ‘yes’ to questions #12) Please choose a **number** from 0 to 10 that best describes the average level of pain you believe he/she experienced over the past 8 hours. 0 means ‘no pain’ and 10 means ‘the worst possible pain’. If you prefer, you can choose one of the faces on the bottom row. The happy face means ‘no pain’ and the sad face means ‘the worst possible pain’.

___________  (specify the #)
___________  missing

14. (Ask if the nurse answered ‘no’ or ‘<4’ to questions #12/13) Please specify why you cannot describe the patient’s pain using this scale.

15. How does this level of pain compare to the level of pain you think he/she was feeling yesterday?  

<table>
<thead>
<tr>
<th>a.</th>
<th>More/Worse than yesterday</th>
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<tbody>
<tr>
<td>b.</td>
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</tr>
<tr>
<td>d.</td>
<td>I don’t know</td>
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<td>e.</td>
<td>Missing</td>
</tr>
</tbody>
</table>

16. Has the patient received medication for the pain during the past 8 hours?  

<table>
<thead>
<tr>
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17. **Patient Study Number:** ____________________  **Nurse's ID Number:** ________________________  (initials/month and day of birth)

 Patient Initials: ___________________________  (initials/month and day of birth)

Date: ___________________  Time:  __________  Completed By: ___________________________

6. (Ask if the nurse answered ‘yes’ to questions #5) Please choose a **number** from 0 to 10 that best describes the level of pain you believe he/she is experiencing right now. 0 means ‘no pain’ and 10 means ‘the worst possible pain’. If you prefer, you can choose one of the faces on the bottom row. The happy face means ‘no pain’ and the sad face means ‘the worst possible pain’.

___________  (specify the #)
___________  missing

7. (Ask if the nurse answered ‘no’ or ‘<4’ to questions #5) Please specify why you cannot describe the patient’s pain using this scale.

8. Has the patient received medication for the pain you think they are experiencing right now?  

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9. Do you think the patient is receiving adequate pain control (enough pain medications to control their pain) right now?  

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Now I am going to ask you some questions that deal with the level of pain you think the patient experienced over the past 8 hours.

10. Do you think this patient has had any pain over the past 8 hours?  

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11. Would you describe the patient’s average level of pain over the past 8 hours as no pain, mild pain, moderate pain, or severe pain?  

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12. Can you describe the average level of pain you think the patient has experienced over the past 8 hours using the following scale that numbers from 0 to 10?  

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13. (Ask if the nurse answered ‘yes’ to questions #12) Please choose a **number** from 0 to 10 that best describes the average level of pain you believe he/she experienced over the past 8 hours. 0 means ‘no pain’ and 10 means ‘the worst possible pain’. If you prefer, you can choose one of the faces on the bottom row. The happy face means ‘no pain’ and the sad face means ‘the worst possible pain’.

___________  (specify the #)
___________  missing

14. (Ask if the nurse answered ‘no’ or ‘<4’ to questions #12/13) Please specify why you cannot describe the patient’s pain using this scale.

15. How does this level of pain compare to the level of pain you think he/she was feeling yesterday?  

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16. Has the patient received medication for the pain during the past 8 hours?  

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Nurse’s Daily Pain Assessment Sheet

Patient Study Number: ____________________ Nurse’s ID Number: ____________________
Patient Initials: ________________________ (initials/month and day of birth)
Date: ________________________ Time: __________ Completed By: ________________________

17. Do you think the patient has received adequate pain control (enough pain medications to control their pain) during the past 8 hours?

_____ yes
_____ no
_____ unsure
_____ missing
Physician’s Daily Pain Assessment Sheet

Patient Study Number:____________________  Physician’s ID Number:   _______________________

Patient Initials:___________________________    (initials/month and day of birth)
Date: ___________________ Time:  __________ Completed By: ___________________________

Able to complete: ___ (yes) ___ (no)
If unable to complete, please specify why: _____ physician off unit
_____ physician on unit but unavailable
_____ physician did not want to participate
_____ physician recently came on service and hasn’t assessed patient
_____ other (specify: _______________________________)

Pain Assessment

1. Do you think this patient has been experiencing pain today?  _____ yes
   _____ no
   _____ unsure
   _____ missing

2a. (Ask if answered yes to question #1) Please explain how you know this patient is experiencing pain today. Some explanations previously described, which may apply to this patient, include:
   _____ patient communicated
   _____ facial grimacing
   _____ vital signs changes
   _____ tearing
   _____ diaphoresis
   _____ localizes pain (agitated with activity)
   _____ Informed by other members of the team
   _____ (other:  ______________________________________________________________________)

2b. (Ask if answered no to question #1) Please explain how you know this patient is not experiencing pain today. Some explanations previously described, which may apply to this patient, include:
   _____ patient communicated
   _____ lack of facial grimacing
   _____ no vital sign changes
   _____ lack of tearing
   _____ lack of diaphoresis
   _____ does not localize pain (does not appear agitated with activity)
   _____ Informed by other members of the team
   _____ (other:  ______________________________________________________________________)

I am going to ask you several questions about this patient’s level of pain right now and their general level of pain during the past 8 hours. The first series of questions deal with the level of pain you think the patient is having right now. The second series of questions deal with the level of pain you think the patient experienced during the past 8 hours. Please answer these questions as honestly as possible.

3. Do you think this patient has any pain right now?  _____ yes
   _____ no
   _____ unsure
   _____ missing

4. Would you describe the patient’s current level of pain as no pain, mild pain, moderate pain, or severe pain?
   _____ no pain
   _____ mild pain
   _____ moderate pain
   _____ severe pain
   _____ unsure
   _____ missing
Physician’s Daily Pain Assessment Sheet

Patient Study Number: __________________________  Physician’s ID Number: _______________________
Patient Initials: ____________________________  (initials/month and day of birth)
Date: ___________________  Time: __________  Completed By: ___________________________

5. Can you describe the patient’s current level of pain using the following scale that numbers from 0 to 10?
   _____ yes
   _____ no
   _____ missing

6. (Ask if the physician answered ‘yes’ to questions #5) Please choose a number from 0 to 10 that best describes the level of pain you believe he/she is experiencing right now. 0 means ‘no pain’ and 10 means ‘the worst possible pain’. If you prefer, you can choose one of the faces on the bottom row. The happy face means ‘no pain’ and the sad face means ‘the worst possible pain’.
   ___________ (specify the #)
   ___________ missing

7. (Ask if the physician answered ‘no’ or ‘<4’ to questions #6) Please specify why you cannot describe the patient’s pain using this scale.

8. Has the patient received medication for the pain you think they are experiencing right now?
   _____ yes
   _____ no
   _____ unsure
   _____ missing

9. Do you think the patient is receiving adequate pain control right now?
   _____ yes
   _____ no
   _____ unsure
   _____ missing

Now I am going to ask you some questions that deal with the level of pain you think the patient experienced over the past 8 hours.

10. Do you think this patient has had any pain over the past 8 hours?
    _____ yes
    _____ no
    _____ unsure
    _____ missing

11. Would you describe the patient’s average level of pain over the past 8 hours as no pain, mild pain, moderate pain, or severe pain?
    _____ no pain
    _____ mild pain
    _____ moderate pain
    _____ severe pain
    _____ unsure
    _____ missing

12. Can you describe the average level of pain you think the patient has experienced over the past 8 hours using the following scale that numbers from 0 to 10?
    _____ yes
    _____ no
    _____ missing

13. (Ask if the physician answered ‘yes’ to questions #12/13) Please choose a number from 0 to 10 that best describes the average level of pain you believe he/she experienced over the past 8 hours. 0 means ‘no pain’ and 10 means ‘the worst possible pain’. If you prefer, you can choose one of the faces on the bottom row. The happy face means ‘no pain’ and the sad face means ‘the worst possible pain’.
    ___________ (specify the #)
    ___________ missing

14. (Ask if the physician answered ‘no’ or ‘<4’ to questions #12) Please specify why you cannot describe the patient’s pain using this scale.
Physician’s Daily Pain Assessment Sheet

Patient Study Number: ___________________________  Physician’s ID Number: ___________________________
Patient Initials: _____________________________ (initials/month and day of birth)
Date: ___________________ Time: __________ Completed By: ___________________________

15. How does this level of pain compare to the level of pain you think he/she was feeling yesterday?
   a. More/Worse than yesterday _____
   b. About the same as Yesterday _____
   c. Less/Better than Yesterday _____
   d. I don’t know _____
   e. Missing _____

16. Has the patient received medication for the pain during the past 8 hours?  _____ yes  _____ no  _____ unsure  _____ missing

Do you think the patient has received adequate pain control during the past 8 hours?  _____ yes  _____ no  _____ unsure  _____ missing

Pain Mentioned in Physician’s Note:  ___Yes  ___No  ___Not Applicable (no Interview performed)
THE PREVALENCE OF PAIN IN THE MEDICAL INTENSIVE CARE UNIT.
Jennifer Hale Smith, Kathryn Engle, Mark D. Siegel. Department of Internal Medicine, Yale University, School of Medicine, New Haven, CT.

We sought to determine the prevalence of pain among patients in the Medical Intensive Care Unit (ICU) and to compare patients’ responses to questions meant to identify the presence and intensity of pain and adequacy of their pain control to those of their nurses and physicians. We prospectively studied patients admitted to the Medical ICU of a university teaching hospital. Each day, patients, nurses and physicians able to respond to questions were asked if the patient was currently in pain, to describe its severity using a 10 point numeric rating scale (0=none, 10=most severe), and to state if control was adequate. Responses were compared for interviews of patients and caregivers. Patients were interviewed about their ICU experience post-ICU discharge. We found a prevalence of pain of between 44% and 46% in the ICU. Twenty-six percent of patients in pain reported inadequate pain control. When comparing patient and caregiver interviews, both nurses and physicians had low rates of detection of patient pain. Nurses detected patients in pain 48% of the time, while physicians correctly did so 73% of the time. Nurses were unable to correctly identify any of the 23 patients who stated their pain was inadequately controlled, while physicians correctly identified 3 of the 7 patients who reported inadequate pain control, for an accuracy rate of 43%. Over 50% of patients who recalled their ICU experience reported experiencing pain in the ICU. When matched with their ICU interviews, 35% patients interviewed at follow-up were unable to accurately recall their reports of ICU pain. At follow-up, 98% of patients rated their overall ICU experience a median of 8 (IQR 7-10). We conclude that patients are experiencing considerable pain in the ICU, although the vast majority of patients believe their pain is adequately controlled. Often nurse and physician caregivers are unaware of their patients’ pain and whether it is adequately controlled. Over one-third of patients demonstrate poor recall of their ICU pain experience. The vast majority of patients rate their overall ICU experience very highly.