A case-control study examining inconsistencies in pain management following fractured neck of femur: an inferior analgesia for the cognitively impaired

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ABSTRACT

Previous research suggests individuals who suffer from cognitive impairment are less able to vocalise pain than the rest of the cognitively-intact population. This feature of cognitive impairment may be leading to a chronic underdetection of pain as current assessment tools strongly rely on the participation of the patient. To explore inconsistencies in pain management within the acute setting, we conducted a retrospective assessment of 224 patients presenting with fractured neck of femur at a large teaching hospital's accident and emergency (A&E) department between 2 June 2011 and 2 June 2012. These patients were split into either a cognitively-impaired or cognitively-intact cohort based on their Abbreviated Mental Test Scores. Patients with cognitive impairment, on average, received a weaker level of analgesia than individuals without impairment both in the ambulance and in A&E. In the ambulance, 45% of cognitively-impaired patients were prescribed no pain relief compared with just 8% of those individuals who remain cognitively intact. After arrival at A&E, these inconsistencies continued with 69% of the cognitively-intact cohort receiving the strongest opioid analgesia compared with just 37% of the cognitively-impaired cohort. The cognitively-impaired cohort would also wait on average an hour longer before receiving this initial pain relief. We believe that these differences stem from cognitively-impaired patients being unable to vocalise their pain through traditional assessment methods. This work discusses the potential development or adoption of a tool which can be applied in the acute setting and relies less on vocalisation but more on the objective features of pain, so making it applicable to cognitively-impaired individuals.

INTRODUCTION

Pain, to use its most basic definition, is the brain's response to a stimulus; a pin-prick produces a grimace, a bee-sting elicits a yelp.¹ However, this response is by no means standardised and will differ dramatically from person to person. An individual's genetic makeup, social attitudes and upbringing will all influence how he or she processes and expresses stimuli.² In the medical profession we have attempted, as best we can, to create systems which compensate and accommodate for these variations within the population. Although a pin-prick may not always stimulate a grimace, if an individual is in pain and requires immediate analgesia he or she will often say and, if not, we can always ask. Self-reporting pain scores are widely

used, both in the ambulance and accident and emergency (A&E) setting, to aid in the management of an individual's pain. The most simple of these, and one which every medical professional across the country will have used, is the numerical pain score. A score of 0 indicates no pain while a score of 10 indicates the worst pain the patient could imagine; analgesia should then be prescribed accordingly with higher scores resulting in stronger levels of analgesia.

Self-reporting pain tools are considered the gold standard of assessment methods in the hierarchy of pain assessment techniques and attempts should be made to obtain a self-report of pain from every patient.²⁻⁴ The issue with this type of tool arises when we consider the necessary skills required by an individual to participate. Self-reporting requires a certain level of linguistic and cognitive aptitude often to a level which may be unachievable for a cognitively-impaired patient.⁵ This cognitive impairment may be a transient state as a result of the patient's injury or illness but equally it may well be a more permanent disorder. From a demographic perspective, patients who present with fractured neck of femur (FNOF), due to their advanced age at presentation, have an increased likelihood of suffering from the latter with dementia being by far the most prevalent cause in the UK. This correlation, coupled with an increasingly elderly British population, means that a consideration of dementia is vital when developing guidelines for the management of FNOF.⁶

The most recent guidelines discussing the management of FNOF were produced by the National Clinical Guideline Centre in 2011.⁷ These described optimal management strategies for patients both with and without dementia, stating that there should be parity between the handling of the two populations. Crucially, adequate pain relief was stated as the most important outcome measure.⁷ The major challenge for health professionals in meeting this standard comes, not from relieving the pathological nature of the pain itself through pharmacological intervention, but from recognising which patients might require the said intervention. This uncertainty stems from a feature of dementia where, as a result of the patient's progressive cognitive decline, there is a reduced tendency to report pain.⁸ Importantly, although patients with dementia are less likely to vocalise their pain, there is evidence suggesting that the inherent sensation is no different from that of a cognitively-intact individual's.^{8,9}

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Previous work has focused mainly on examining pain management within care homes and other long-term care facilities revealing a serious underdiagnosis of chronic pain across our institutionalised elderly population.^{10–13} The presence of dementia has been shown to significantly compound the risk of pain underdiagnosis, especially in severe dementia where vocalisation, cognitive ability and the patient's memory become so attenuated that traditional self-report techniques are rendered practically redundant.^{14–15} Despite research suggesting that in cognitively-impaired individuals these verbal techniques are severely lacking in both reliability and validity, they are still widely used for their simplicity and speed, especially in the acute setting.^{14–16–17} After the 'gold-standard' self-assessment tool, the hierarchy of assessment techniques recommends a number of other methods for pain assessment. 'Observational' or 'behavioural' assessment tools are currently under investigation for use in severe forms of dementia.¹⁸ The Abbey pain scale and the checklist of non-verbal pain indicators are two such techniques which rely primarily on behavioural and physiological cues, so reducing the active involvement of the individual in the measurement.^{19–20} These measures, when used correctly, have been shown to provide a suitable alternative for measuring pain in patients with dementia but there is little evidence to support their implementation in the emergency setting.

AIMS AND OBJECTIVES

The overwhelming majority of studies examining the treatment of pain in patients with cognitive impairment are carried out using cohorts from care home or peri-operative settings, thus limiting their usefulness. This study aims to investigate pain management in an emergency setting, comparing the handling of cognitively-impaired patients against their cognitively-intact counterparts following FNOF. Data from both cohorts will be compared to investigate whether inadequacies or inequalities are present in the management of patients who present with a cognitive impairment.

METHODOLOGY

This study collected data from all patients presenting to Wythenshawe Hospital A&E department with an FNOF over a 12-month period, between 2 June 2011 and 2 June 2012. The hospital's FNOF registry was used to identify the study population and relevant data were retrospectively gathered from casualty cards (CAS cards) and/or patient notes. An Excel based collection tool was used to store patient data and the population was split into either a cognitively-intact or a cognitively-impaired cohort based on their Abbreviated Mental Test Scores (AMTS). On admission to A&E, an AMTS examination was carried out and, for the purposes of this study, a patient scoring less than 7 was considered to be cognitively impaired.²¹ A cut-off point of 7 was chosen as a score below this mark is indicative of dementia. Although the AMTS is by no means diagnostic, its validity and sensitivity have been verified by a number of studies.^{22–24} In addition, to recognise the continuous as opposed to bivariate nature of AMTS, managements were compared on scatter plots allowing comparison to be made between individual AMTS.

Following a review of gathered data, a set of exclusion criteria were developed to control for extenuating circumstances and to ensure validity. Extenuating circumstances which resulted in the patient's exclusion from the study included: if the patient did not present at A&E via an ambulance, if the patient had declared taking his or her own medication in lieu of prescribed

analgesia and if any necessary data were absent despite requisition of the patient's notes.

In order to compare the analgesic management of our two cohorts, the various types of pain relief offered throughout the population were classified into distinct groups. These were based on WHO pain ladder classifications and five categories were defined (table 1). If individuals received multiple medications they were classified based upon their highest strength medication.

STATISTICAL ANALYSIS

Where applicable, data were analysed using SPSS with either a *t* test or a χ^2 test. Significance was assumed for probabilities of 0.05 or below. For scatter plots, the coefficient of determination (R^2) was generated using Excel.

RESULTS

During the 12-month study, 224 patients presented to Wythenshawe A&E with FNOF, 64 of whom were classified as cognitively impaired. Of this cohort, 20 patients failed to meet the inclusion criteria leaving 44 individuals with cognitive impairment in the study population. Considerably more individuals without cognitive impairment presented over the 12-month period, resulting in an Excel generated random sample of 65 patients taken from the population of 160 individuals. The mean age of presentation was 82 years and both included a higher proportion of women than would be expected in the normal population; the cognitively-intact cohort included an 80% female population while the impaired cohort's demographic was strikingly female orientated at 93%.²⁵

We began by comparing managements in the prehospital setting and analysis demonstrated significant differences between the handling of the two cohorts ($p < 0.001$). First, a significantly higher proportion of cognitively-impaired patients (45%) were offered no pain relief whatsoever compared with their cognitively-intact counterparts, of whom just 8% were prescribed no analgesia (figure 1A). There were no real differences between the proportion of patients receiving levels 1 and 2 analgesia but a striking difference was observed in the prescription of the strong, level 3 opioids such as morphine with just 20% of cognitively-impaired patients receiving maximum strength pain relief compared with 32% of cognitively-intact patients (figure 1A). There was also a significant difference noted between the two groups with regard to the prehospital use of Entonox. Overall, 37% of those individuals without cognitive impairment received the gas in the ambulance, notably higher than the 9% of patients within the cognitively-impaired cohort who received comparative treatment. Plotting the AMTS against each other on a scatter plot further confirmed these findings suggesting that

Table 1 Medication categories

	Category				
	1	2	3	4	5
Description	No analgesia given	Entonox only <i>NO₂ and O₂ 1:1</i>	WHO pain ladder level 1 <i>Paracetamol Ibuprofen Aspirin</i>	WHO pain ladder level 2 <i>Co-codamol Tramadol</i>	WHO pain ladder level 3 <i>Morphine Oramorph</i>

The types of analgesia prescribed in the ambulance and the accident and emergency department were separated into five categories. Patients were assigned to one of the categories based on their strongest medication prescribed. Examples of the various medications can be seen in italics.

Figure 1 Prehospital medication. (A) The percentage of the two cohorts receiving the different categories of analgesia (table 1) in the prehospital setting was calculated and displayed for comparison. A significant difference was found between the management of the two cohorts on χ^2 analysis ($p < 0.001$). (B) The Abbreviated Mental Test Scores (AMTS) were then compared against each other using a scatter plot to assess the effect of increases in AMTS. The coefficient of determination showed that as AMTS increase so does the chance of receiving any medication whatsoever ($R^2 = 0.66$), but specifically level 3 analgesia ($R^2 = 0.46$) and Entonox ($R^2 = 0.11$).

as an individual's AMTS fall, so do his or her chance of receiving medication in the prehospital setting ($R^2 = 0.66$) (figure 1B).

Following arrival at A&E, all patients will have been assessed and prescribed analgesia based upon their apparent level of pain. The length of time it took to receive this initial pain relief was determined by calculating the time between arrival and the time that the first analgesic medication was administered. A significant difference ($p < 0.001$) in the length of time it took to receive initial pain relief was seen between the cognitively-intact patients, who waited on average 2:05:17, and the cognitively-impaired patients who waited almost an hour longer at 3:00:03 (figure 2A). In addition to the time spent waiting for initial

analgesia, the average overall waiting times in A&E were determined for each of the two groups. No significant differences were noted between the two cohorts; however, cognitively-impaired patients waited on average an extra 20 min (NS; $p > 0.05$) (figure 2A). These findings were confirmed when comparing the waiting times for each AMTS using a scatter plot. The results demonstrated very little change in overall waiting time ($R^2 \sim 0$) as AMTS increase but there is an obvious inverse relationship between a patient's AMTS and time between admission and first dose of analgesia ($R^2 = 0.35$) (figure 2B).

As part of the initial assessment, pain scores should be taken on admission to determine the level of analgesia required, usually

Figure 2 Waiting times in A&E. a) A bar chart comparing both (i) the time it took following admission for medication to be administered to both cohorts and (ii) the overall waiting time in accident and emergency. Error bars show the standard error of the mean. Data were analysed via a two tailed T-test. Significance is demonstrated as * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. b) The AMT scores were then compared against each other using a scatter plot to assess the effect of increases in AMTS. The coefficient of determination demonstrates that changes in AMTS has little effect on the overall time spent in A&E ($R^2 \approx 0$) but as AMTS increases the average time before first dose of analgesia post-admission ($R^2 = 0.35$) falls.

via a subjective numerical pain score. These scores should be recorded on the CAS card; however, a significant number of individual's subjective pain scores were not present. This issue particularly affected the cognitively-impaired cohort with 55% of these individuals failing to have their pain scores recorded compared with just 25% of the cognitively-intact cohort.

Using the same WHO pain scale as previously (table 1), a significant discrepancy was observed ($p < 0.001$) in the strength of

analgesia prescribed following admission to A&E (figure 3A). Dementia patients were far more likely to receive level 1 analgesia than their non-dementia counterparts with 37% of dementia sufferers receiving the lowest level of pain relief compared with just 17% of the non-demented cohort. The most significant discrepancy arises when examining the use of the level 3 opioids within the two groups; over two-thirds of non-dementia patients (69%) were prescribed a class 3 opioid, whereas just

Figure 3 Accident and emergency (A&E) analgesia. (A) The percentage of cognitively-impaired and cognitively-intact patients receiving the various categories of analgesia (table 1) is presented for comparison. Only categories 3, 4 and 5 were found to be used in A&E; therefore, the data from category 1 and 2 have been excluded from the figure. Data were analysed via a χ^2 test. A significant difference ($p<0.001$) was found between the management of the two cohorts. (B) The Abbreviated Mental Test Scores (AMTS) were subsequently compared against each other using a scatter plot to assess the effect of increases in AMTS on the types of analgesia prescribed. The coefficient of determination demonstrates that increases in the AMTS have a mild effect on the prescription of level 1 ($R^2=0.01$) and level 2 ($R^2=0.015$) analgesia but a more pronounced effect on the prescription of level 3 analgesia ($R^2=0.65$).

over a third of dementia patients (37%) received comparable analgesic management (figure 3A). These findings are not just restricted to the bivariate analysis of the two cohorts but can be seen when considering the AMTS as a continuous measure (figure 3B).

DISCUSSION

This is the first study to directly evaluate variations in pain management between cognitively-impaired and cognitively-intact individuals in the emergency setting. Previous studies have

noted that patients with cognitive impairment present with a range of barriers to adequate analgesia which are not normally seen in the elderly population as a whole.²⁶ By splitting the FNOF cases at Wythenshawe Hospital over the course of 12 months into two distinct cohorts, this audit was able to show that the management of pain in cognitively-impaired patients is significantly different to their cognitively-intact counterparts.

These discrepancies appear to originate in the prehospital setting within the ambulance as patients are brought to the emergency department. As well as beginning to stabilise the

acutely ill patients, paramedics are primarily responsible for the rapid commencement of analgesia which, if effective, has been shown to significantly improve the management of patients once they reach the emergency department.^{27 28} To achieve adequate prehospital pain management, the UK Ambulance Service clinical practice guidelines advocate the use of verbal pain scales as the most appropriate method of evaluating the amount of analgesia required.²⁹ These numerical, patient orientated scales are unlikely to be of value in patients with more severe cognitive impairment. This offers an explanation for the dramatic differences in pain relief strategies observed between the two cohorts in the prehospital setting. The most striking result arising from the preadmission data is that 45% of cognitively-impaired patients were prescribed no analgesia compared with just 8% of cognitively-intact patients. We would suggest that this discrepancy is a direct result of cognitively-impaired patients not being able to vocalise their pain meaning paramedics are less likely, when following the UK ambulance guidelines, to administer analgesia in this population.

The prehospital results suggest that cognitively-impaired patients are more likely to arrive in hospital having been prescribed weaker analgesia than their cognitively-intact counterparts. Therefore, on admission to A&E, one would expect the cognitively-impaired cohort on average to receive a more potent analgesia than the intact cohort who comparatively had been aggressively managed in the ambulance. In practice, the opposite was observed with the cognitively-intact cohort receiving significantly higher levels of analgesia than the cognitively-impaired patients. Individuals without cognitive impairment had a 69% chance of being prescribed the highest level of analgesia whereas patients with cognitive impairment were almost half as likely to receive this maximum level of pain relief. It is widely accepted that cognitively-impaired individuals experience pain in the same way as the rest of the population; therefore, the lower levels of analgesia prescribed for the cognitively-impaired cohort cannot be simply be attributed to lower levels of pain. We propose that this variance stems from two main factors: first, there is a chronic underdetection of pain in cognitively-impaired individuals due to lack of vocalisation resulting in a reciprocal undertreatment of this pain. Second, if pain is detected in these individuals, medical professionals are less likely to prescribe strong opioids to individuals who may be unable to communicate whether the analgesia is effective. Regardless of the reason for the inconsistencies, improving prescribing confidence when dealing with cognitively-impaired individuals is the key to achieving optimal management. We would advocate the retraction of 'patient centred' scales for cognitively-impaired individuals and support the introduction of observational tools within emergency departments. These tools would allow for the initial measurement of pain and then subsequent re-evaluation to assess whether the analgesia had been effective.

We observed that not every patient had a pain score recorded on admission, even in the non-dementia cohort where 25% of individuals had no score attributed to them in the notes. The significant reduction in recorded pain scores for the cognitively-impaired cohort, where just 45% had a score noted, is likely to be a result of a number of factors. Failure to record the score or to carry out an assessment is a possibility and may explain some of the missing data from both groups. However, the differences between the two cohorts must be due to other factors, specifically related to the nature of the cognitive impairment itself. We would suggest that this difference is a result of fewer cognitively-impaired patients being able to provide

answers needed for the self-reporting pain scales. These data then further support the case for alternative pain tools but also raise questions as to how pain scales are taken and recorded in the acute setting as a whole.

These results cumulatively demonstrate that individuals with cognitive impairment, on average, receive weaker analgesia than their cognitively-intact counterparts throughout their management. This concerning finding is further compounded when considering that despite 45% of cognitively-impaired individuals receive no analgesia in the ambulance, as a group they wait almost an hour longer to receive any medication once admitted to A&E. This, arguably more than any other result, suggests that there is a significant problem regarding the processing and management of cognitively-impaired individuals in the acute setting. Why this extra hour wait exists is likely to be a result of a multitude of factors. Again, however, we believe that one of the major causes of this prolongation is reduced vocalisation of pain in the cognitively-impaired population. This potentially results in their needs being interpreted as less immediate and less prominent than cognitively-intact individuals who are able to directly express their need for analgesia.

Our findings are consistent with those reported by other authors who have mainly examined pain management for dementia patients outside of the acute setting.^{12 30 31} Attempts have been made to develop observational pain tools for use in the cognitively-impaired population and many are approved and recommended for use in clinical practice.³²⁻³⁴ However, these pain tools are designed, in the majority, for use in long-term care settings where the operator has a prior knowledge of the patient's normal behaviour and character. The Abbey pain scale, for example, asks the operator to rate the 'change' in the patient's facial expression, behaviour and physical characteristics. This may well be suitable if there is prior knowledge of the patient but without this the tool is somewhat limited.¹⁹ This is not to say that techniques such as this could not be modified for use in the acute setting. Indeed, a systematic review of the literature, investigating the relevance of pain tools for cognitively-impaired individuals in the ambulance setting, described the Abbey pain scale as having a potential application in the paramedic's assessment of pain.³⁵

CONCLUSIONS

This investigation suggests that there are a multitude of significant discrepancies with regard to the management of cognitively-impaired patients from the earliest of stages within the acute setting. Failures in pain recognition and treatment within the ambulance are not rectified once the patients have been admitted to A&E, where individuals with cognitive impairment have a longer wait to receive a weaker analgesia. Although this study specifically examines FNOF patients, we would suggest that the variances in management between cognitively-impaired and cognitively-intact individuals are likely to be present no matter what the modality of pain. Therefore, at all stages of emergency medicine we propose that there should be a concerted effort to adopt or develop appropriate tools to identify pain in cognitively-impaired individuals.

Contributors ML initiated the study and supervised throughout. DN was responsible for collating patient data and performing literature review. JM assisted data collection and was responsible for the drafting of the paper which was subsequently reviewed by DN and ML.

Competing interests None.

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