

PAIN

Effect of communication on pain during intravenous cannulation: a randomized controlled trial

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Background. Clinicians frequently warn patients of discomfort before potentially painful procedures, despite the lack of evidence that such communications are helpful. We aimed to compare two communications (one with, and the other without, a warning of a 'sting') immediately before i.v. cannulation in order to measure differences in perceived pain by patients during the procedure.

Methods. Randomly assigned patients awaiting elective surgery received a communication immediately before i.v. cannulation consisting of either 'I am going to apply the tourniquet and insert the needle in a few moments. It's a sharp scratch and it may sting a little' (Group S) or 'I am going to apply the tourniquet on the arm. As I do this many people find the arm becomes heavy, numb and tingly. This allows the drip to be placed more comfortably' (Group NS). Cannulation pain was measured by a 0–10 verbal numerical rating score (VNRS) and five-point Likert scale.

Results. Of 101 participants, 49 were allocated to Group S and 52 to Group NS. Median VNRS pain scores with inter-quartile ranges (IQR) were 1 and 2, respectively, for both groups. Median Likert scores were 3 in Group S and 2 in Group NS with an IQR of 1 for both groups ($P=0.13$). Six participants vocalized pain in Group S and none in Group NS ($P=0.01$). Three participants withdrew their arm spontaneously in Group S and none in Group NS ($P=0.11$).

Conclusions. Warning patients of a 'sting' before i.v. cannulation may not be helpful.

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As in any other branch of medicine, communication skills are essential for the practice of anaesthesia.^{1–3} They signify professionalism⁴ and make an important contribution to clinical management.⁵ Trust, empathy, and autonomy all depend on effective communication between doctor and patient.⁶ Investigations of the effect of communication in improving anaesthetic and perioperative outcomes began nearly half a century ago.⁷ There has been increasing interest in recent years regarding the clinical use of hypnosis and suggestion in facilitating therapeutic subconscious responses in patients experiencing pain both during childbirth⁸ and perioperatively.^{9–11} Communications by the anaesthetist can elicit subconscious patient responses in mood, perception or

behaviour such as anxiolysis and analgesia.¹² Well recognized, psychological causes of anxiety before a procedure include: the expectation of pain and the sense of a 'loss of control'.¹³ Cognitive reframing is a recognized, relevant pain reduction strategy. For example, calling the sensation of a local anaesthetic injection 'a numbing sensation' rather than 'a sting' may result in quite different perceptions and patient behaviours.¹⁴ Recent research into the neurobiology of placebo, nocebo, and expectation has begun to explain how words can hurt both metaphorically and literally.^{15–20} A well-designed observational study has demonstrated that statements with negative emotional content increased patient anxiety and pain when compared

with those patients receiving neutral or positive comments.²¹ The lack of well-designed randomized trials on this topic has led us to investigate subconscious responses to communication using an i.v. cannulation pain model. We aimed to compare two communications (one with, and the other without, a warning of a 'sting') immediately before i.v. cannulation and measure patient pain perception.

Methods

This prospective, randomized, blinded study was conducted in a large tertiary referral centre for surgery in South Australia. It was approved by the local ethics committee and registered with the Australian Controlled Trial Register (ACTRN012605000741684). After written and informed patient consent, we recruited 101 unpremedicated adults awaiting elective surgery where placement of an i.v. cannula was required. Patients were excluded if they were unable to communicate in English, intellectually impaired, age <18 yr, had recently ingested analgesic medication, or had a known history of difficult venous access or poor peripheral veins on examination. Patients were informed that we were investigating different methods of providing information and how that affected their experience during insertion of the drip. The information sheet included the explanation that: 'We aim to place a drip in the most comfortable, safest way possible. We believe that information given to you is important and may affect how a procedure is experienced. By participating in this study you will help show whether the type of information given affects the experience perceived during venous cannulation'.

Randomization and allocation concealment

Study participants were randomly allocated to one of the two groups ('Sting' Group S and 'No Sting' Group NS). A random number sequence was computer generated in blocks. Allocation concealment was assured using consecutively numbered, opaque, sealed envelopes, which were opened by the anaesthetist performing the procedure (J.D.-G.) approximately 1 min before i.v. cannulation.

Interventions

The anaesthetist inserting the i.v. cannula informed Group S participants: 'I am going to apply the tourniquet and insert the needle in a few moments. It's a sharp scratch and it may sting a little'. Group NS participants were told: 'I am going to apply the tourniquet on the arm. As I do this many people find the arm becomes heavy, numb and tingly. This allows the drip to be placed more comfortably'.

Outcome measures

The primary outcomes for this study were: a verbal numerical rating score (VNRS) for pain from 0 to 10 and

a five-point Likert score (completely comfortable; quite comfortable; slight discomfort; painful; and very painful).

Secondary outcomes were: the presence of spontaneous patient arm withdrawal and the presence of unprompted vocalization of pain or discomfort, during i.v. cannulation.

Blinding

Patient and the researcher (T.B.) recording primary outcomes were blinded to participant allocation. Data collected by the operator included: the site of venous cannulation, the number of attempts, the presence of any comments or vocalization by the patient during the procedure, and the presence of any withdrawal response of the patient's arm during i.v. cannulation. All data analyses were performed by researchers blinded to group allocation.

Study procedures

After a 13 patient pilot to standardize study procedures, all 101 patients had their i.v. cannula inserted by a single anaesthetist (J.D.-G.). In the procedure room, the next consecutively numbered opaque-sealed envelope was opened. The allocated statement was then communicated to the patient immediately before applying the tourniquet and preparing the skin with 70% isopropyl alcohol. I.V. access was obtained using a 20 G i.v. cannula (B. Braun Introcan® Safety™; Bethlehem, PA, USA). Manoeuvres to assist vein localization, such as clenching the fist and tapping the skin, were used where necessary. The operator (J.D.-G.) recorded secondary outcome measures and the site of venous cannulation and the number of i.v. access attempts. After this, the primary outcome measures were obtained and recorded by the blinded researcher (T.B.) within 2 min of i.v. cannula placement.

Sample size calculation

A small pilot of 13 patients was conducted, where VNRS for pain during i.v. cannula insertion were measured. A mean VNRS of 4.4 and standard deviation of 2.4 was found. We calculated that a difference in VNRS of 0.93 would be detected with 80% power and a type 1 error of 0.05 if there were 100 subjects in each group. Although we initially aimed to recruit 200 patients, time and resource constraints restricted our study to 101 included participants.

Data management

Intention to treat analysis was planned. Descriptive statistics and the Mann-Whitney *U*-test were used for non-parametric data. A Fisher's exact test was used for dichotomous data of 'arm withdrawal response' and patient vocalization of pain during i.v. cannula insertion.

Table 1 Vocalization and arm withdrawal

	Group S (<i>n</i> =49)	Group NS (<i>n</i> =52)	<i>P</i> -value (Fisher's exact test)
Number of patients vocalizing	6 (12%)	0	0.01
Number of patients withdrawing arm	3 (6%)	0	0.11

Results

We approached 103 patients and two declined to participate. One patient spoke poor English and appeared not to understand the study. The other patient gave no specific reason. None of the approached patients were needle phobic. The 101 remaining participants all completed the study and received their allocated intervention. The mean age of study participants in Group S was 46.1 (SD 19.4) and for Group NS 50.4 (SD 18.1). There were 15 males (31%) and 34 females (69%) in Group S and 28 males (54%) and 24 females (46%) in Group NS. Groups were comparable for age ($P=0.28$) but not for gender ($P<0.05$). The dorsum of the non-dominant hand was used in all but four participants in Group S (8%) and in all but four participants in Group NS (8%). It took two attempts to gain i.v. access in three participants in Group S (4%) and one participant in Group NS (2%). The scores for both VNRS and Likert scales were not normally distributed. VNRS scores ranged from 0 to 8 for Group S [median=1, inter-quartile range (IQR)=2] and from 0 to 7 for Group NS (median=1, IQR=2). Likert scores for Group S ranged from 1 to 4 (median=3, IQR=1) and from 1 to 3 for Group NS (median=2, IQR=1). No significant differences between Group S and Group NS were found using the Wilcoxon rank sum (Mann–Whitney) test for two independent samples on either the VRS ($P=0.53$) or the Likert scale scores ($P=0.13$). Table 1 shows the number of participants vocalizing pain and spontaneously withdrawing their arm during i.v. cannulation. Fisher's exact test revealed a significant difference between the two groups for vocalization of pain ($P=0.01$) but not for arm withdrawal ($P=0.11$).

Discussion

Suggestions under anaesthesia that elicit subconscious responses after operation have been investigated previously,^{22–23} but little attention has been given to the use of this form of communication to facilitate subconscious therapeutic responses in the non-anaesthetized patient. This study is the only randomized controlled trial that has compared a typical 'warning' of pain, with a communication informing the patient of the procedure with no reference to pain or discomfort. We attempted to control for all aspects of the study apart from the intervention by

having a single operator placing the i.v. cannula. We have used the placement of an i.v. cannula as a pain model for this study as this is one of the most common procedures performed by anaesthetists. Although we did not find a significant difference between the two groups in VNRS and Likert scale scores, more participants vocalized pain spontaneously during i.v. insertion (e.g. by exclaiming 'ouch' or 'ow' during the procedure) in Group S than in Group NS. This suggests that the procedure is less painful and better tolerated when no warning of a sting is given and is quite contrary to what is generally believed. Similarly, the non-significant increased incidence of a withdrawal response in Group S could be interpreted in the same way. However, our sample size was inadequate to determine whether there was a correlation between withdrawal response and the requirement for multiple attempts to gain i.v. access. It is likely that general success at the first attempt is increased with less patient movement. This could be of particular relevance where the consequences of patient movement are more serious, for example, during epidural catheter placement. The lack of previous randomized trials probably reflects a lack of awareness of these subconscious responses outside the hypnotherapeutic and psychology literature. The logistical challenges of informed patient consent and performing randomized trials that investigate behavioural interventions may also be a factor.

The use of language and terminology shapes both our perception of reality and our actions based on that perception. Lang and colleagues⁹ demonstrated that structured attention and self-hypnosis are effective non-pharmacological pain reduction strategies during invasive medical procedures. Most anaesthetists learn their trade and then work subconsciously most of the time. This allows the practice of anaesthesia to be not only an art but also a state of mind.²⁴ Communicating with patients is such an everyday part of the anaesthetist's day that little thought is given to the subconscious responses of patients to their verbal and non-verbal cues. Despite their ubiquitous use in hospital practice, terms such as: 'sharp scratch!', 'sharp prick!', and 'nasty sting!' are widely used presumably because it is believed that these warnings are helpful in some way. The diversity of deeply held beliefs and metaphors about pain and its alleviation contribute to the complexity of its management²⁵ and its investigation.

Our study has several limitations. First, this study was a small, unfunded investigation. Time and resource constraints resulted in our failure to achieve our original planned sample size. As there was no preliminary data on this topic apart from a small pilot, we had planned to study the maximum number of patients considered feasible, given the level of resources available at the time. The original study sample size would have detected a 0.93 difference in pain scores between the groups; however, with 50 participants/group, a difference in pain scores of 1.3 would have been required for the study to have a

power of 80% and an alpha of 0.05. The clinical relevance of detecting relatively small differences in pain score between the groups could be questioned. However, i.v. cannulation is not of itself an excessively painful procedure and there was an expectation that any detectable differences in pain would be small. In addition, the communication intervention is extremely benign, simple to implement, and has no known side-effects. Therefore, any difference demonstrated between the groups could be considered highly clinically relevant, particularly as inadvertent negative suggestions are so ubiquitous in clinical practice. Secondly, the observer for patient arm withdrawal and vocalization was also the proceduralist, and therefore, was not blinded to participant allocation. This lack of blinding for these outcomes could be overcome in a future study, if the procedure was video recorded and then assessed by an independent observer. Thirdly, there were more females than males in Group S. The evidence that gender may have an effect on pain perception and responses is conflicting.^{26–29} It is possible that the female patients may have perceived pain or responded differently with regard to vocalization and movement than males. In our study, five of the six patients vocalizing pain were female, interestingly only male patients had arm withdrawal during i.v. cannula insertion. Fourthly, the anaesthetist investigator inserting the i.v. cannula might have influenced patient responses either consciously or subconsciously. In order to minimize this possibility, the operator anaesthetist in this study had only a minimal knowledge of suggestion or hypnotherapy. The communication he used with Group S subjects suggesting a ‘sting’ was based on his usual practice when inserting an i.v. cannula (thinking that this was helpful). If there was any bias of the operator, it would be expected to be in the direction of less pain in Group S participants. Finally, we used a VNRS scale rather than a visual analogue scale (VAS). This was because the VNRS is simpler to administer, gives consistent results, and correlates well with the VAS.³⁰ However, parametric pain data on a 100 mm scale would have been useful for more accurate assessment of small differences in pain perception and calculating sample sizes with respect to different outcomes in future studies. The categorical Likert scale used in this study also has the limitations of the VNRS; it is, however, a useful tool to describe the magnitude of pain and is the most common example used to grade pain relief.³⁰ Despite these limitations, this study is a first attempt to objectively test subconscious responses to communications in clinical anaesthetic practice.

In summary, the analysis in our study has shown some interesting findings. In particular that warning patients of a ‘sting’ before i.v. cannulation does not appear to be beneficial, and may in fact be counter productive. These findings support those of Lang and colleagues²¹ and call into question the widespread practice of using words with negative emotional content that suggest sensations are

going to be painful or unpleasant experiences. It has been suggested that these communications by healthcare providers in anticipation of a supposedly painful intervention may become a self-fulfilling prophecy. The patient’s experience of pain after the use of such language may then reinforce the healthcare provider’s belief of its appropriateness.²¹ Our findings require further study, but if validated, could have implications for clinical practice not only in anaesthesia but across specialties.

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References

- 1 Smith AF, Shelly MP. Communication skills for anesthesiologists. *Can J Anaesth* 1999; **46**: 1082–8
- 2 Smith AF, Pope C, Goodwin D, Mort M. Communication between anesthesiologists, patients and the anesthesia team: a descriptive study of induction and emergence. *Can J Anaesth* 2005; **52**: 915–20
- 3 Fallowfield L, Jenkins V, Farewell V, Saul J, Duffy A, Eves R. Efficacy of a Cancer Research UK communication skills training model for oncologists: a randomised controlled trial. *Lancet* 2002; **359**: 650–3
- 4 Kopp VJ, Shafer A. Anesthesiologists and perioperative communication. *Anesthesiology* 2000; **93**: 548–55
- 5 Buckman R. Communications and emotions. *Br Med J* 2002; **325**: 672
- 6 Coulter A. Paper was muddled. Response to: Burkitt Wright E, Holcombe C, Salmon P. Doctors’ communication of trust, care and respect in breast cancer: qualitative study. *Br Med J* 2004; **328**: 1318
- 7 Egbert AM, Battit GE, Welch CE, Bartlett MK. Reduction of post-operative pain by encouragement and instruction of patients. *N Engl J Med* 1964; **270**: 825–7
- 8 Cyna A, McAuliffe G, Andrew M. Hypnosis for pain relief in labour and childbirth: a systematic review. *Br J Anaesth* 2004; **93**: 505–11
- 9 Lang EV, Benotsch EG, Fick LJ, et al. Adjunctive non-pharmacological analgesia for invasive medical procedures: a randomised trial. *Lancet* 2000; **355**: 1486–90
- 10 Montgomery GH, Weltz CR, Seltz M, Bovbjerg DH. Brief presurgery hypnosis reduces distress and pain in excisional breast biopsy patients. *Int J Clin Exp Hypn* 2002; **50**: 17–32
- 11 Lucas-Polomeni MM. Hypnosis: a new anesthetic technique! *Paediatr Anaesth* 2004; **14**: 975–6
- 12 Bejenke CJ. Painful medical procedures. In: Barber J, ed. *Hypnosis and Suggestion in the Treatment of Pain*. London: W.W. Norton, 1996; 209–61
- 13 Grieve J. Day surgery preoperative anxiety reduction and coping strategies. *Br J Nurs* 2002; **11**: 670–8
- 14 Cyna AM, Andrew M. Words can help! *Pain* 2005; **117**: 239
- 15 Price DD, Finniss DG, Benedetti F. A comprehensive review of the placebo effect: recent advances and current thought. *Annu Rev Psychol* 2008; **59**, in press [Epub ahead of print, doi 10.1146/annurev.psych.59.113006.095941]
- 16 Benedetti F, Lanotte M, Lopiano L, Colloca L. When words are painful: unraveling the mechanisms of the nocebo effect. *Neuroscience* 2007; **147**: 260–71
- 17 Benedetti F. What do you expect from this treatment? Changing our mind about clinical trials. *Pain* 2007; **128**: 193–4

- 18 Benedetti F. Placebo and endogenous mechanisms of analgesia. *Handb Exp Pharmacol* 2007; **177**: 393–413
- 19 Colloca L, Benedetti F. How prior experience shapes placebo analgesia. *Pain* 2006; **124**: 126–33
- 20 Benedetti F. Placebo analgesia. *Neurol Sci* 2006; **27**: S100–2
- 21 Lang EV, Hatsiopoulou O, Koch T, et al. Can words hurt? Patient–provider interactions during invasive procedures. *Pain* 2005; **114**: 303–9
- 22 Block RI, Ghoneim MM, Sum Ping ST, Ali MA. Efficacy of therapeutic suggestions for improved postoperative recovery presented during general anesthesia. *Anesthesiology* 1991; **75**: 746–55
- 23 Lebovits AH, Twersky R, McEwan B. Intraoperative therapeutic suggestions in day-case surgery: are there benefits for postoperative outcome? *Br J Anaesth* 1999; **82**: 861–6
- 24 Nadaraja S. The art of anaesthesia. *Lancet* 2001; **358**: 1110
- 25 Shafer A. Metaphor and anesthesia. *Anesthesiology* 1995; **83**: 1331–42
- 26 Reddy H, Arendt-Nielsen L, Staahl C, et al. Gender differences in pain and biomechanical responses after acid sensitization of the human esophagus. *Dig Dis Sci* 2005; **50**: 2050–8
- 27 Stinshoff VJ, Lang EV, Berbaum KS, Lutgendorf S, Logan H, Berbaum M. Effect of sex and gender on drug-seeking behavior during invasive medical procedures. *Acad Radiol* 2004; **11**: 390–7
- 28 Robinson ME, George SZ, Dannecker EA, et al. Sex differences in pain anchors revisited: further investigation of ‘most intense’ and common pain events. *Eur J Pain* 2004; **8**: 299–305
- 29 Averbuch M, Katzper M. Gender and the placebo analgesic effect in acute pain. *Clin Pharmacol Ther* 2001; **70**: 287–91
- 30 Australian and New Zealand College of Anaesthetists. Assessment and measurement of acute pain and its treatment. In: Macintyre P, ANZCA Working Party, eds. *Acute Pain Management: Scientific Evidence*, 2nd Edn. Melbourne: Commonwealth of Australia, 2005; 20–31