Original Article

Prevalence of acute post-operative pain in patients in adult age-group undergoing inpatient abdominal surgery and correlation of intensity of pain and satisfaction with analgesic management: A cross-sectional single institute-based study

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Access this article online

Website: www.ijaweb.org

DOI: 10.4103/0019-5049.191686

Quick response code

ABSTRACT

Background and Aims: Considering the paucity of regional data, this study was designed to investigate the prevalence of post-operative pain and determine if there exists any correlation between the intensity of post-operative pain and patient's level of satisfaction with their pain management after inpatient abdominal surgery at an academic tertiary care government centre. **Methods:** Pain intensity was measured in 120 patients with numeric rating scale at the fifth post-operative hour, second and third post-operative day. A questionnaire was used to measure the level of satisfaction with nurse's and doctor's response to their pain and overall pain management. **Results:** The prevalence of post-operative pain was 84.17%, 92.5% and 96.66% at the fifth post-operative hour, second and third post-operative day, respectively. Less number of patients experienced severe intensity pain on the third post-operative day (P = 0.00046), whereas the number of patients experiencing mild pain increased (P < 0.000) compared to the fifth post-operative hour. The number of patients with complete analgesia decreased on the third post-operative day (P = 0.001 compared to fifth post-operative day). The Spearman correlation coefficient between pain score on the third post-operative day and level of satisfaction with nurse's response, doctor's response to pain and the overall pain management was – 0.0218 (P = 0.8107), 0.1307 (P = 0.1553) and 0.0743 (P = 0.4195), respectively. **Conclusion:** There is a high prevalence of acute post-operative pain in patients undergoing inpatient abdominal surgery at our institute. There is a weak correlation between the intensity of pain and level of satisfaction with pain management.

Key words: Numeric rating scale, pain, patient satisfaction, post-operative

INTRODUCTION

The reported prevalence of acute post-operative pain varies widely.[1-3] Inadequate treatment of post-operative pain is associated with various adverse consequences.[1,3,4] It is generally presumed that the presence of post-operative pain adversely influences the patient's experience of the perioperative period and negatively impacts perioperative satisfaction. However, recent literature suggests that there exists a multifarious relationship between them.[5,6]

Although various therapeutic options to minimise acute post-operative pain have been evaluated by researchers

How to cite this article: Singh PK, Saikia P, Lahakar M. Prevalence of acute post-operative pain in patients in adult age-group undergoing inpatient abdominal surgery and correlation of intensity of pain and satisfaction with analgesic management: A cross-sectional single institute-based study. Indian J Anaesth 2016;60:737-43.

from India, not much data could be retrieved by the authors regarding the prevalence or factors influencing the other aspects of post-operative pain from the Indian subcontinent, even after thorough literature search.

Therefore, this study aims to evaluate the prevalence and intensity of acute post-operative pain and examine if there exists any correlation between patient's intensity of pain and level of satisfaction with his/her pain management, in patients of inpatient abdominal surgery in a government-run academic tertiary care centre.

METHODS

After approval by the Institutional Ethics Committee (No. MC/233/2013/354), a prospective, single-group, descriptive study was conducted after obtaining informed consent from the participants during January–May 2015. The study population consisted of patients between 18 and 60 years of age, inclusive of all sexes, who underwent elective abdominal surgery of 1–3 h in duration and were able to communicate in Hindi with the first author. Convenience sampling method was used. Those patients who were unable to understand the questions posed by the researcher, with chronic pain, receiving antipsychotic drugs, on chronic use of analgesics, pregnant patients, patients undergoing surgery for malignant disorder and trauma were excluded from the study. The anaesthetic management was at the discretion of the attending anaesthesiologists. In all the cases who received spinal anaesthesia, 3.2–3.8 ml 0.5% hyperbaric bupivacaine with 60–100 μg buprenorphine was used. General anaesthetic management was similar as the drugs that were in government supply (ondansetron hydrochloride, propofol, tramadol hydrochloride, atracurium besylate, ketorolac tromethamine, paracetamol hydrochloride infusion, halothane, isoflurane, neostigmine methylsulphate, midazolam hydrochloride and glycopyrrolate bromide) were used. Post-operative analgesics were prescribed by the surgical team. All patients received a combination of intramuscular pentazocine and promethazine along with diclofenac sodium and/or paracetamol hydrochloride infusion. Acute post-operative pain at rest was evaluated at the fifth post-operative hour, second and third post-operative days by numeric rating scale (NRS).[7] For further analysis, pain was classified as mild (NRS 1–3.5), moderate (NRS 4–6.5) and severe (NRS >6.5). The three questions (question numbers 11, 12 and 18) that were put to patients to rate their satisfaction required them to report satisfaction on a six-point scale [Questionnaire available online]. This questionnaire was based on the format used by Phillips *et al*.[8] The treating physician and nursing staff were not aware of the study hypothesis or outcome measures. The first author collected the data and was not a part of the team that provided perioperative care to the patients.

Data obtained were exported to a Microsoft Excel 2007 (v12.0, Microsoft®) spreadsheet. Demography and surgery-related characteristics including age, gender, level of education, occupation and type of abdominal surgery are reported with frequency, percentage, median with interquartile range and mean with standard deviation as deemed necessary. The prevalence rates are expressed as percentages. Scatter plots were generated using Microsoft Excel 2007 (v12.0, Microsoft®). Proportions of patients at different categories of pain intensity (mild, moderate and severe) were compared with two-sample *z*-test [Table 1]. Patients with NRS <4 and ≥4 were compared with Chi-square test with Yates' continuity correction [Table 1]. Spearman correlation coefficient (ρ) and its 95% confidence interval (CI) were calculated using an online calculator (available from http://vassarstats.net/corr_rank.html accessed on April 16, 2016). Receiver operating characteristic (ROC) curve was built by plotting the sensitivity, or true positive rate, as a function of the false positive rate (1-specificity) at different NRS points. For

Table 1: Prevalence of acute post-operative pain

Intensity of pain (NRS)	Post-operative period					
	Fifth post-operative hour		Second day		Third day	
	Prevalence (%) (95% CI)	Total number	Prevalence (%) (95% CI)	Total number	Prevalence (%) (95% CI)	Total number
0	15.83 (10.04-23.87)	19	7.5 (3.7-14.15)	9	3.33 (1.07-8.82)	4*
1-3.5	13.33 (8.05-21.04)	16	35.83 (27.43-45.15)	43†	55.0 (45.67-64.0)	66‡
4-6.5	40.83 (32.06-50.19)	49	37.5 (28.97-46.84)	45	30.0 (22.15-39.15)	36
>6.5	30.0 (22.15-39.15)	36	19.17 (12.78-27.58)	23	11.6 (6.76-19.12)	14§

The statistically significant difference of proportion is marked with symbols. *P=0.001, compared to fifth post-operative hour, †P<0.000, compared to fifth post-operative hour, ‡P<0.000 and P=0.0028 compared to fifth post-operative hour and second post-operative day, respectively, §P=0.00046 compared to fifth post-operative hour. CI – Confidence interval; NRS – Numeric rating scale

ROC analysis, those entire patients who rated their satisfaction with overall pain management 'very satisfied' and 'satisfied' were regarded as 'satisfied' and the rest as 'not satisfied'. Calculation of Cronbach's alpha and creation of the ROC curve and calculation of the area under curve (AUC) were carried out by the second author using Microsoft Excel 2007 (v12.0, Microsoft®). $P < 0.05$ was taken to be statistically significant.

As we could not gather data regarding the prevalence of acute post-operative pain following abdominal surgery from developing countries, considering the reported prevalence of 55% for day care surgeries, for a population of 1500 with a desired precision of 0.08 and confidence level of 0.95, 136 samples were needed.[3] With an α error of 0.05 and power of 0.8, considering a Spearman rank correlation coefficient of −0.31 between pain intensity score and patient satisfaction with overall pain management, a sample size of 63 was required.[8] The sample size was calculated using two online calculators (available from http://epitools.ausvet.com.au/content.php?page = 1Proportion and https://www.statstodo.com/ssizcorr_pgm.php). Thus, considering a possible attrition rate of 10%, we decided to include 150 patients.

RESULTS

In this study, among the 150 patients eligible to participate, complete data could be obtained from 120 post-operative patients (60 males and 60 females) only (80% response rate). The demographic profile and the description of the surgical procedures are mentioned in Table 2.

Spinal anaesthesia was used in 19.16% (23/120) patients and none have received regional or epidural anaesthesia/analgesia. The prevalence of pain at different study points in time is mentioned in Table 1.

The median with an interquartile range of NRS at the fifth post-operative hour, second and third post-operative days is reported in Figure 1. The number of patients experiencing no pain was significantly low on the third post-operative day compared to the fifth hour. There was an increase in a number of patients experiencing moderate pain as the post-operative period progressed and it reached statistical significance [Table 1]. Less number of patients (statistically significant) experienced severe pain on the third post-operative day compared to those at the fifth post-operative hour ($P = 0.00046$) [Table 1].

Table 2: Demographic characteristics and surgery-related data

Age	Mean±SD (years)	Frequency (%)	
Overall study population	37.33±11.25	-	
Male patients	40.02±11.24	50	
Female patients	34.65±10.69	50	
Educational qualification	**Total number (frequency (%))**	**Male (frequency (%))**	**Female (frequency (%))**
None	11 (9.2)	1 (1.7)	10 (16.7)
Passed 5th standard	9 (7.5)	2 (3.3)	7 (11.7)
6th standard to 8th standard pass	16 (13.3)	7 (11.7)	9 (15.0)
9th standard to 10th standard pass	39 (32.5)	20 (33.3)	19 (31.7)
11th standard to 12th standard pass	26 (21.7)	17 (28.3)	9 (15.0)
Up to completion of graduation	19 (15.8)	13 (21.7)	6 (10)
Occupation	**Total number (frequency (%))**		
None	13 (10.8)		
Home maker (male and female)	38 (31.7)		
Government employee	13 (10.8)		
Private firm employee	18 (15.0)		
Self employed	26 (21.7)		
Student	12 (10.0)		
Types of surgery	**Total number (frequency (%))**	**Number of male**	**Number of female**
Open cholecystectomy	56 (46.67)	25	31
Laparoscopic cholecystectomy	29 (24.17)	10	19
Open hernioplasty	18 (15)	15	3
Open appendicectomy	13 (10.83)	8	5
Open cholecystectomy and appendicectomy	4 (3.33)	2	2

SD – Standard deviation

The number of patients with pain intensity of NRS <4 increased significantly over the studied points of time (between the fifth post-operative hour and second post-operative day, $P = 0.0317$; the fifth post-operative hour and third post-operative day, $P = 0.0001$; the second and third post-operative days, $P = 0.0282$).

Cronbach's alpha for the questionnaire (question numbers 11, 12 and 18) was 0.70 [Questionnaire]. Responses of patients regarding pain intensity and patient satisfaction are mentioned in Table 3. Ninety-four (78%) patients were either very satisfied or satisfied with nurse's response whereas 95.8% (115/120) patients were either very satisfied or satisfied with doctor's response to pain treatment. Around 92% (110/120, 91.7%) of patients reported that they were either very satisfied or satisfied with overall pain management. Spearman correlation coefficients between NRS and level of satisfaction, along with their 95% CI and two-tailed *P* values are mentioned in Figure 2. The ROC curves for prediction of satisfaction with overall analgesic management and NRS values at the three study points of time are mentioned in Figure 2. AUC (95% CI) of the ROC curves for NRS at the fifth post-operative hour, second and third post-operative days are 0.334 (0.143–0.524), 0.420 (0.227–0.612) and 0.583 (0.407–0.759), respectively. On hypothesis analysis, the two-tailed *P* values for the AUC mentioned above are 0.087, 0.413 and 0.356, respectively.

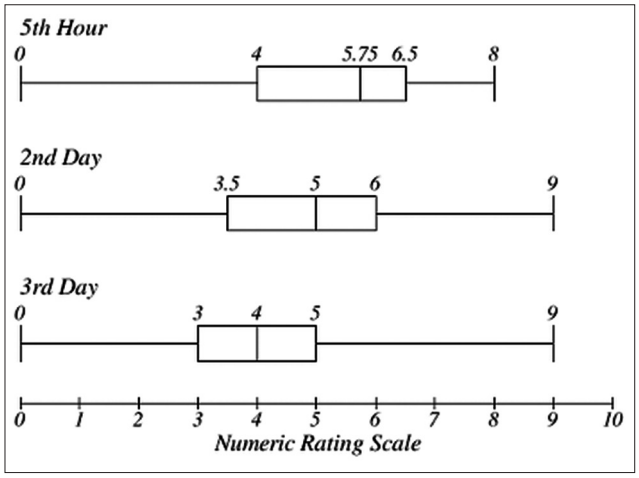

Figure 1: Box-and-whisker plot of intensity of pain during the study

DISCUSSION

Acute post-operative pain is very much prevalent in patients undergoing elective abdominal surgeries at our institution. Data regarding the prevalence and other aspects of acute post-operative pain from India are not available.[9] Reported worldwide prevalence varies from 14% to 70% depending on the intensity considered, type of surgery and anaesthesia, time of data collection, institutional protocol for pain management, etc.[1,2,3,10-12] A temporal change in intensity of pain was noted in our study. The reported temporal shift of different magnitude of pain differs among studies.[3,11,12] While comparing the prevalence of patients experiencing different intensities of pain, it should be noted that NRS has been found to be reliable to measure post-operative pain in a rural population from this subcontinent, irrespective of literacy status.[13] The patients in our study underwent abdominal surgeries (mainly open upper abdominal surgeries) with increased risk of intense pain, whereas in many studies, the patients underwent surgeries of different level of invasiveness with the diverse propensity for severe acute post-operative pain.[2,3,10,11,14]

The interplay of a multitude of factors acts as barriers to an effective management of post-operative pain.[15,16] Among others, the lack of routine monitoring of pain, pre-existing pain, surgical fear, inadequate awareness about perioperative pain, attitude of the attending physician and nurse and use of an inadequate dose of analgesics are responsible for the inadequate address of post-operative pain.[1,14] At present, our hospital does not have an acute pain treatment service and analgesics are commonly prescribed by the surgeons unless a continuous regional block technique is used. It is surprising that in a highly developed country of

Table 3: Responses regarding pain management and patient satisfaction

Level of satisfaction	Patient's feedback regarding nurse's response for pain management, *n* (%)	Patient's feedback regarding doctor's response for pain management, *n* (%)	Patient's feedback regarding overall treatment of pain management, *n* (%)
Very satisfied	30 (25.0)	57 (47.5)	30 (25.0)
Satisfied	64 (53.3)	58 (48.3)	80 (66.7)
Slightly satisfied	19 (15.8)	3 (2.5)	7 (5.8)
Slightly dissatisfied	3 (2.5)	1 (0.8)	3 (2.5)
Dissatisfied	4 (3.3)	1 (0.8)	0
Very dissatisfied	0	0	0

Correlation of intensity of pain and level of satisfaction						
Numeric Rating Scale (NRS)	Nurse`s response		Doctor`s response		Overall satisfaction	
	ρ (95% CI)	p Two tailed	ρ (95% CI)	p Two tailed	ρ (95% CI)	p Two tailed
NRS at fifth hour	-0.0494 (-0.226-0.131)	0.590215	-0.0498 (-0.227-0.13)	0.590215	-0.0585 (-0.235-0.122)	0.523413
NRS on second day	-0.1476 (-0.318-0.032)	0.107902	-0.0888 (-0.263- 0.09)	0.334031	-0.1538 (-0.324-0.026)	0.093668
NRS on third day	-0.0218 (0.158 – 0.199)	0.8107	0.1307 (-0.049 – 0.302)	0.1553	0.0743 (-0.106 – 0.25)	0.4195

ρ- Spearman Correlation Coefficient

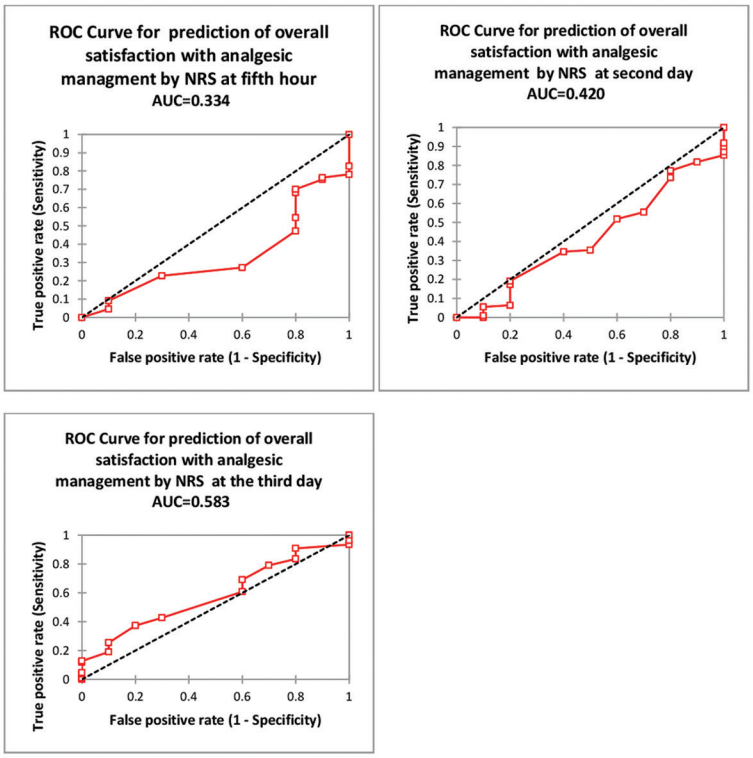

Figure 2: Spearman correlation coefficient and receiver operating characteristics curve of numeric rating scale and level of satisfaction

Europe, even with an acute pain control program in place, up to 50% patients experienced moderate to severe pain after abdominal surgery.[12] Nonetheless, this high prevalence of acute post-operative pain clearly demonstrates that optimal management is definitely lacking. Although access to limited resources, be it physical capital, consumable or human, should not be a limiting factor to optimal pain management, in our opinion, it might have played a role. However, we need to look into the other barriers that prevented the provision of adequate pain relief so as to device a comprehensive departmental pain management strategy. In the meantime, we have started more frequent use of some less costly interventions, for example, infiltration of the surgical site with local anaesthetic (LA), infiltration of the transversus abdominis plane with LA by the surgeon, single-shot intercostal block, etc.

Indices based on patient satisfaction are increasingly recognised as an important quality outcome indicator of health care.[17] We observed that although a large number of patients have experienced moderate or even severe pain, vast majority of patients were satisfied with their post-operative pain management. A weak correlation ($\rho < 0.3$) between pain intensity and level of satisfaction was also observed in our study. The AUC of the ROC curve suggests that NRS on the fifth post-operative hour, second and third post-operative days is of no value in predicting satisfaction with overall analgesic management. In contrast to Hanna *et al*., Chung and Lui and

our findings, many authors have reported that a relationship exists between increasing pain relief and satisfaction.[5,6,18-21] Considering the overall high level of satisfaction in our study group, it appears that pain relief alone is not the only factor that affects patient satisfaction with pain management.[5] The observed high level of satisfaction with pain management even with inadequate management of pain is very relevant. This observation further substantiates the fact that there exists a complex interplay of the intensity of the perceived pain and how other pain specific needs are met. However, this should not deter from adequate analgesic management. Various other factors, for example, attitude of the care giver, age, sex, pre-operative expectation and actual experience of pain relief, ethnicity and a variety of other complex variables determine the disparities in clinical pain, both in patient's perception of pain and its treatment.[5,21-23] Patient's response may also be modified to please the staff and vary with the social gap between the patient and health care provider.[24,25] It is very crucial to note that in India, satisfaction level regarding health care is high in certain populations.[25] It is noteworthy that the *P* values of the correlation coefficient and the AUC of the ROC measured in our study are rather large and not all the studies consulted by the authors report the *P* value. It is difficult to comment whether the observed high *P* value for ρ and AUC was due to small sample size or plain chance; however, the 95% CI values suggest that there is a very weak relationship of post-operative pain intensity and overall satisfaction with analgesic management. Thus, it may be argued that it is just an illusion that low pain intensity scores are epitome of positive patient satisfaction and high pain intensity scores are a symbol of negative patient satisfaction.

The strength of this study could be limited by the fact that we employed a convenience sample and could not reach the targeted sample size. This is very important as patients with different socio-demographic background may have a different perspective towards pain.[23] Many may answer survey questions by reporting how they think the questions should be answered instead of how they actually feel as respondents frequently report the positive answers when answering questions on satisfaction.[26] The staffing and their individual pain management preferences may have confounded our observation. This study provides data from a government-run single institution only. Both government-run public and 'for profit' private health-care facilities from middle- and low-income group countries have their strengths and weakness; however, public sector hospitals are known to be less responsive to patients and have inadequate availability of supplies compared to private sector hospitals.[27] Thus, data from health-care facilities belonging to different organisational arrangement need to be reported.

It is the need of the hour to report the prevalence of acute post-operative pain from different categories of health-care facilities across India. The factors behind the differences of prevalence, if observed, need to be studied. It is also needed to analyse the factors behind patient's satisfaction with their analgesic treatment, keeping in mind the diversity of the country we live in.

CONCLUSION

The present study demonstrates that a significant proportion of patients suffer moderate to severe intensity of pain in the immediate as well as early post-operative period after abdominal surgery in an academic tertiary care government-run hospital. Despite this, most of the patients were satisfied with their pain management.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

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QUESTIONNAIRE IN LOCAL LANGUAGE

प्रश्नावली

१. नाम आयु

२. लिंग पुरुष ☐ महिला

३. शल्यचिकित्सा प्रकार:

४. शिक्षा उपलब्धि:

५. जीविका निर्वाहन के लिए आप क्या करते है?

६. को- मॉर्बिड कंडीशन: ए. एस. ए. स्तर:

७. दर्द स्तर तुला के अनुसार दर्द का स्तर:

शल्यचिकित्सा के पश्च्यात समय	वी. ए. एस.	एन. आर. एस	वी. आर. एस.
५ घंटे पश्च्यात			
दुसरे दिन			
तीसरे दिन			

८. पिछले २४ घंटे मे आप ने क्या किसी दर्द का अनुभव किया?

.....हाँ .....ना

९. इस दर्द स्तर तुला के अनुसार पिछले २४ घंटे मे अत्यधिक दर्द (एन. आर. एस)

१०. इस दर्द तुला के अनुसार पिछले २४ घंटे मे औसत दर्द (एन. आर. एस)

११. आपके दर्द के वर्णन को लेकर नर्स के प्रतिउत्तर से आप कितने संतुष्ट या असंतुष्ट हैं इसके लिए एक उपर्युक्त पद का चुनाव कीजिये-

..... अधिक असंतुष्ट ..... कम संतुष्ट

..... असंतुष्ट ..... संतुष्ट

..... कम असंतुष्ट ..... अधिक संतुष्ट

१२. आपके दर्द के वर्णन को लेकर चिकित्सकों के प्रतिउत्तर से आप कितने संतुष्ट या असंतुष्ट हैं इसके लिए एक उपर्युक्त पद का चुनाव कीजिये-

..... अधिक असंतुष्ट ..... कम संतुष्ट

..... असंतुष्ट ..... संतुष्ट

..... कम असंतुष्ट ..... अधिक संतुष्ट

१३. क्या कभी ऐसा हुआ की जो दवा आपको दर्द निवारण के लिए दी गयी आपको कोई भी सहायता ना की हो और आप ने ज्यादा दवा या किसी और दवा की मांग कि अपने दर्द निवारण के लिए?

..... हाँ ..... ना

१४. अगर आप का उत्तर हाँ है तो क्या आप को कोई और दवा दी गयी?

..... हाँ ..... ना

१५. अगर दी गयी तो क्या उसने काम किया?

..... हाँ ..... ना

१६. क्या आपने चिकित्सक समुदाय से अनुमानित शल्यचिकित्सा के दर्द के बारे मे पूछा?

..... हाँ ..... ना

१७. दर्द की जो तीवता आप महसूस कर रहे हैं, क्या चिकित्सक समुदाय ने आपको उसके बारे मे जानकारी दी थी?

..... हाँ ..... ना

१८. अपने दर्द के उपचार को लेकर आप समस्त रूप से कितने संतुष्ट या असंतुष्ट हैं इसके लिए एक एक उपर्युक्त पद का चुनाव कीजिये |

..... अधिक असंतुष्ट ..... कम संतुष्ट

..... असंतुष्ट ..... संतुष्ट

..... कम असंतुष्ट ..... अधिक संतुष्ट

१९. क्या आपको लगता है की दर्द, होने वाली चिकित्सा का निर्पवाद रूप से उपस्थित रहने वाला भाग है?

२०. दर्द निवारण दवा की आज्ञाप्ति हुयी

शल्य चिकित्सक द्वारा..... एनेस्थेसिओलोजिस्ट द्वारा.....

२१. दर्द निवारण की दवा जो उपयोग की गयी

१.

२.

३.

४.

Adapted from Phillips S et al [8]