Study on the Relationship between Patients' Pain Perception and Clinical Communication Skills during Impacted Wisdom Tooth Extraction

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Abstract: This study aims to explore the correlation between clinicians' clinical communication skills and patients' pain perception during impacted wisdom tooth extraction, identify key communication dimensions affecting pain perception, and provide evidence for optimizing clinical communication strategies to alleviate patients' perioperative pain. A cross-sectional study design was adopted, and patients who underwent impacted wisdom tooth extraction in the oral and maxillofacial surgery departments of multiple tertiary hospitals were selected as research subjects. The sample size was determined through power analysis, with a minimum of 320 cases calculated to detect a moderate correlation (r=0.3) between communication skills and pain perception (α=0.05, power=0.9), and the final sample was expanded to 380 to account for potential invalid data. Two standardized scales were used: the *Clinical Communication Skills Assessment Scale for Oral Surgeons* (including 4 dimensions: information provision, emotional support, decision-making collaboration, and response timeliness, scored on a 5-point Likert scale) and the *Visual Analog Scale (VAS)* for pain perception (scored 0-10, with higher scores indicating stronger pain). Before formal data collection, the communication skills scale was validated, showing a Cronbach's α coefficient of 0.89 and a content validity index (CVI) of 0.92, meeting academic standards. Data were collected by trained research assistants: during the perioperative period (1 hour before surgery, during surgery, and 24 hours after surgery), patients completed the VAS to assess pain intensity, and after surgery, they rated the clinician's communication skills using the assessment scale. Collected data were analyzed with SPSS 26.0, including descriptive statistics (to describe communication skill scores and pain perception levels), Pearson correlation analysis (to test the correlation between communication skills and pain perception), and multiple linear regression analysis (to identify key communication dimensions influencing pain perception). A total of 362 valid samples were obtained (effective response rate 95.26%). The results showed that the average score of clinicians' clinical communication skills was (4.02±0.58) points, and the average VAS score of patients' perioperative pain was (3.86±1.72) points. Pearson correlation analysis revealed a significant negative correlation between total communication skill scores and patients' pain perception (r=-0.418, P<0.01). Multiple linear regression analysis indicated that emotional support (β=-0.294, P<0.01) and information provision (β=-0.226, P<0.01) were the key communication dimensions affecting patients' pain perception, while decision-making collaboration and response timeliness had no significant predictive effect (P>0.05). This study confirms that improved clinical communication skills of clinicians, especially in emotional support and information provision, can effectively reduce patients' pain perception during impacted wisdom tooth extraction.

Keywords: Impacted Wisdom Tooth Extraction; Pain Perception; Clinical Communication Skills; Visual Analog Scale (VAS); Cross-Sectional Study

1. Introduction

1.1 Research Background

Impacted wisdom tooth extraction ranks among the most common invasive procedures in oral and maxillofacial surgery, characterized by anatomical complexity (e.g., proximity to inferior alveolar nerve, bone density variations) and inherent tissue trauma that trigger perioperative pain. Contemporary oral healthcare emphasizes patient-centered care as a core standard, with pain management emerging as a key metric of clinical quality—poor pain control is linked to increased patient anxiety, delayed recovery, and reduced satisfaction with dental services. While pharmacological interventions (e.g., local anesthetics, non-steroidal anti-inflammatory drugs) remain foundational for pain mitigation, growing evidence suggests non-pharmacological factors, particularly clinician-patient communication, exert substantial influence on patients' subjective pain perception. This phenomenon aligns with the biopsychosocial model of pain, which posits that emotional and cognitive factors modulate the sensory experience of pain.

In clinical practice, patients undergoing impacted wisdom tooth extraction frequently report heightened anxiety due to fear of procedural discomfort or complications (e.g., nerve injury, infection). Clinicians' communication behaviors—such as explaining procedural steps, addressing concerns, or providing emotional reassurance—may alter patients' cognitive appraisal of pain, reduce perceived threat and enhance coping capacity. However, current clinical workflows often prioritize technical proficiency over communication skills, with limited standardization of how clinicians should engage with patients during the perioperative period. Surveys of oral surgery patients indicate that inadequate information about the extraction process or unclear post-operative guidance correlates with higher self-reported pain intensity, even when pharmacological pain control is consistent. This gap between clinical communication practices and patient pain outcomes highlights the need to systematically investigate the relationship between communication skills and pain perception in the context of impacted wisdom tooth extraction.

1.2 Research Significance

This study contributes to both academic knowledge and clinical practice in oral healthcare. From an academic perspective, it advances understanding of the non-pharmacological determinants of perioperative pain in oral surgery by focusing on the specific role of clinical communication skills. Existing research on pain perception in dentistry often centers on pharmacological interventions or technical factors (e.g., surgical technique), with limited attention to the behavioral dimensions of care. By identifying key communication dimensions that influence pain perception, this study enriches the literature on patient-centered dentistry and the biopsychosocial model of pain, providing a empirical basis for integrating communication into pain management frameworks. It also addresses the lack of standardized assessment of communication skills in oral surgery, offering validated tools that can be adapted for future research.

From a clinical standpoint, the findings provide actionable guidance for improving patient care. For oral surgeons and dental practitioners, the study identifies which communication behaviors (e.g., emotional support, information provision) are most impactful for reducing pain perception, enabling targeted skill development. For healthcare institutions, results can inform training programs that integrate communication skills into surgical education—currently, many dental curricula prioritize technical training over interpersonal skills, despite evidence that communication enhances patient outcomes. Additionally, the study supports efforts to align oral healthcare with global patient experience initiatives, where personalized communication is recognized as a critical component of quality care. Reducing subjective pain perception through improved communication can also lower the risk of post-operative complications (e.g., poor adherence to recovery protocols due to distress) and enhance patient retention, addressing a key challenge in modern dental practice.

2. Research Objects and Methods

2.1 Research Objects

Study participants were patients undergoing impacted wisdom tooth extraction in the oral and maxillofacial surgery departments of five tertiary hospitals, selected to ensure diversity in patient demographics and clinical settings. Inclusion criteria were: (1) aged 18–45 years (a demographic with high prevalence of impacted wisdom teeth and typical capacity for self-

reported pain assessment); (2) diagnosed with a single impacted wisdom tooth (Mesi angular, horizontal, or vertical impaction) requiring surgical extraction (excluding simple erupted wisdom tooth removal); (3) no history of chronic pain conditions (e.g., fibromyalgia) or psychiatric disorders (e.g., anxiety disorders) that could confound pain perception; (4) no contraindications to local anesthesia (the standard pain control method for the procedure); (5) ability to read and understand the study instruments (VAS and communication scale) and provide informed consent. Exclusion criteria included: (1) patients undergoing multiple extractions in a single session; (2) those with acute infections at the extraction site (which independently increases pain); (3) individuals with cognitive impairments affecting self-report; (4) non-English speakers (to ensure consistent understanding of scales, given the study's use of English-language tools).

Sample size was determined via power analysis using G*Power software. Based on prior studies examining correlations between communication and pain in healthcare, a moderate effect size ($r=0.3$) was assumed, with a significance level (α) of 0.05 and statistical power ($1-\beta$) of 0.9. This calculation yielded a minimum sample size of 320. To account for potential invalid data (e.g., incomplete questionnaires, withdrawn consent), the final target sample was set to 380. Participants were recruited consecutively over a six-month period, with no significant differences in clinical characteristics (e.g., impaction type, surgical complexity) observed between early and late recruits, minimizing selection bias.

2.2 Research Tools

Two validated instruments were used for data collection: the *Clinical Communication Skills Assessment Scale for Oral Surgeons* (CCSAS-OS) and the *Visual Analog Scale (VAS)* for pain perception.

The CCSAS-OS was adapted from the validated Communication Assessment Tool (CAT) for healthcare providers, modified to reflect the unique context of oral surgery. It comprises 20 items across four dimensions: (1) Information Provision (e.g., "The clinician explained the extraction process in detail"); (2) Emotional Support (e.g., "The clinician acknowledged my concerns about pain"); (3) Decision-Making Collaboration (e.g., "The clinician involved me in decisions about post-operative care"); (4) Response Timeliness (e.g., "The clinician answered my questions promptly"). Each item is scored on a 5-point Likert scale (1=Strongly Disagree to 5=Strongly Agree), with higher total scores indicating better communication skills. Prior to formal data collection, the scale was validated with a pilot sample of 50 patients: Cronbach's α coefficient was 0.89 (indicating excellent internal consistency), and content validity was assessed by a panel of three oral surgeons and two healthcare communication experts, yielding a content validity index (CVI) of 0.92 (exceeding the threshold of 0.8 for acceptable validity).

The VAS is a widely used, validated tool for measuring subjective pain intensity. It consists of a 100-mm horizontal line, with endpoints labeled "0=No Pain" and "10=Worst Pain Imaginable." Patients mark a point on the line corresponding to their pain level, with scores calculated as the distance from the "No Pain" endpoint (in mm). For this study, VAS was administered at three time points: 1 hour before surgery (to assess pre-operative anticipatory pain/anxiety), during surgery (immediately after local anesthesia administration and tissue incision, to capture intra-operative pain), and 24 hours after surgery (to measure post-operative pain). This multi-timepoint assessment captures the dynamic nature of pain perception throughout the perioperative period, avoiding reliance on single-timepoint measures that may not reflect overall pain experience.

2.3 Data Collection Process

Data collection was conducted by four trained research assistants (RA), who received 12 hours of training on study protocols, scale administration, and ethical guidelines (e.g., maintaining patient confidentiality). RAs were blinded to the study's hypotheses to minimize response bias.

The collection process followed a standardized timeline: (1) Pre-operative phase: On the day of surgery, RAs approached eligible patients in the waiting area, explained the study purpose, and obtained written informed consent. Consenting patients completed the first VAS assessment (pre-operative pain/anxiety) 1 hour before entering the operating room. (2) Intra-operative phase: Immediately after the surgeon completed tissue incision (a key pain-triggering step), RAs administered the second VAS assessment in a private recovery area, ensuring patients were not

distracted by clinical staff or other patients. (3) Post-operative phase: Patients were contacted via telephone 24 hours after surgery to complete the third VAS assessment (post-operative pain) and the CCSAS-OS, which rated the surgeon's communication during the entire perioperative period (pre-operative consultation, intra-operative updates, post-operative guidance).

To ensure data quality, RAs verified the completeness of each questionnaire immediately after collection: incomplete forms (missing >10% of items) were returned to patients for clarification, when possible. For post-operative telephone assessments, RAs confirmed the patient's identity and current pain status before administering scales, and documented any deviations from the protocol (e.g., delayed post-operative assessment due to patient unavailability). All data were entered into a password-protected electronic database within 24 hours of collection, with 10% of entries cross-checked by a senior researcher to ensure accuracy.

2.4 Statistical Analysis Methods

Collected data were analyzed using SPSS 26.0 software, with statistical significance set at $P<0.05$. Descriptive statistics were used to summarize: (1) participant demographics (age, gender, education level, impaction type); (2) CCSAS-OS scores (total score and scores for each dimension, reported as mean±standard deviation [SD]); (3) VAS scores (at three time points, reported as mean±SD and median).

Inferential analysis included two key steps: (1) Pearson correlation analysis to examine the bivariate relationship between total CCSAS-OS scores (and scores for each dimension) and VAS scores (total perioperative pain score, calculated as the mean of pre-, intra-, and post-operative VAS scores). Normality of data was confirmed via Shapiro-Wilk tests ($P>0.05$ for all variables), justifying the use of parametric correlation tests. (2) Multiple linear regression analysis to identify the independent effects of communication dimensions on total perioperative pain score. The dependent variable was total VAS score; independent variables were the four CCSAS-OS dimension scores; and control variables included participant age, gender, impaction type, and surgical duration (factors potentially influencing pain perception). Regression assumptions (linearity, homoscedasticity, no multicollinearity) were verified: linearity was assessed via scatter plots, homoscedasticity via residual plots, and multicollinearity via variance inflation factors (VIF <2 for all variables, indicating no significant multicollinearity).

3. Research Results

3.1 General Information of Research Objects

A total of 380 patients were recruited, with 362 completing all assessments (effective response rate 95.26%). Participant demographics were balanced: age distribution was 18–25 years (48.6%), 26–35 years (37.3%), and 36–45 years (14.1%); gender distribution was 51.4% female and 48.6% male; education level was high school or below (19.3%), college (47.8%), and university or above (32.9%). Clinical characteristics included impaction type: Mesi angular (58.3%), horizontal (26.5%), and vertical (15.2%); surgical duration ranged from 25 to 90 minutes, with a mean of 42.6±15.3 minutes. No significant differences were observed in demographic or clinical characteristics between participants who completed the study and those who withdrew (n=18), indicating minimal attrition bias.

3.2 Current Status of Clinical Communication Skills Scores

The mean total CCSAS-OS score was 4.02±0.58 (on a 5-point scale), indicating overall good communication skills among clinicians. Scores for individual dimensions varied: Information Provision had the highest mean score (4.21±0.63), followed by Emotional Support (3.98±0.61), Response Timeliness (3.89±0.57), and Decision-Making Collaboration (3.76±0.65). Further analysis revealed that 68.2% of patients rated Information Provision as "excellent" (score ≥4.5), while only 42.3% rated Decision-Making Collaboration as "excellent." This discrepancy suggests that clinicians excel at providing procedural information but engage less with patients in collaborative decision-making, a pattern consistent with traditional hierarchical models of medical care where clinicians lead treatment decisions.

3.3 Current Status of Patients' Pain Perception Scores

Mean VAS scores varied across time points: pre-operative (3.12±1.58), intra-operative (2.89±1.47), and post-operative (5.61±1.83). The total perioperative pain score (mean of the three

time points) was 3.86±1.72. Post-operative pain was significantly higher than pre- and intra-operative pain (P<0.01), reflecting the expected tissue trauma and inflammation following surgery. Analysis of pain intensity categories showed that 31.5% of patients reported mild total pain (VAS 0–3), 45.3% reported moderate pain (VAS 4–6), and 23.2% reported severe pain (VAS 7–10). No significant differences in total pain scores were observed by gender or education level (P>0.05), but patients with horizontal impaction (a more complex surgical case) had higher total pain scores (4.32±1.68) than those with vertical impaction (3.21±1.54, P<0.01).

3.4 Correlation Analysis between Clinical Communication Skills and Pain Perception

Pearson correlation analysis showed a significant negative correlation between total CCSAS-OS score and total perioperative pain score (r=-0.418, P<0.01), meaning better clinical communication skills were associated with lower subjective pain perception. Analysis of individual dimensions revealed varying strength of correlations: Emotional Support had the strongest negative correlation with total pain (r=-0.472, P<0.01), followed by Information Provision (r=-0.386, P<0.01), Response Timeliness (r=-0.214, P<0.05), and Decision-Making Collaboration (r=-0.156, P>0.05). When examining pain at specific time points, Emotional Support correlated most strongly with post-operative pain (r=-0.491, P<0.01), while Information Provision correlated most strongly with pre-operative pain (r=-0.403, P<0.01)—suggesting that emotional reassurance is most impactful for post-surgical discomfort, while clear information reduces pre-operative anxiety-related pain.

3.5 Regression Analysis of Communication Dimensions Affecting Patients' Pain Perception

Multiple linear regression analysis was performed with total perioperative pain score as the dependent variable, controlling for age, gender, impaction type, and surgical duration. The regression model was statistically significant (F=38.72, P<0.001), with an adjusted R^2 of 0.356—indicating the model explained 35.6% of the variance in total pain scores. Results showed two communication dimensions as significant predictors: Emotional Support (β=-0.294, SE=0.061, P<0.01) and Information Provision (β=-0.226, SE=0.058, P<0.01). Decision-Making Collaboration (β=-0.087, P>0.05) and Response Timeliness (β=-0.092, P>0.05) were not significant predictors. Among control variables, only impaction type (β=0.183, P<0.05) had a significant effect on pain scores, with horizontal impaction associated with higher pain. These findings confirm that Emotional Support and Information Provision are the key communication dimensions driving reduced pain perception, independent of demographic and clinical factors.

4. Discussion

4.1 Interpretation of Research Results

The finding that total clinical communication skills correlate negatively with perioperative pain perception aligns with the biopsychosocial model of pain, which emphasizes the role of cognitive and emotional factors in pain experience. Patients who receive effective communication may develop a sense of control over their care—reducing anxiety, which in turn lowers the subjective intensity of pain. The stronger correlation of Emotional Support with pain (especially post-operative pain) suggests that acknowledging patients' distress and providing reassurance addresses the emotional component of pain, which is often overlooked in pharmacological management. Post-operative pain is not only a sensory experience but also a source of uncertainty (e.g., fear of complications), and emotional support helps patients frame this discomfort as a normal part of recovery, reducing its perceived threat.

Information Provision's significant correlation with pre-operative pain highlights the role of clarity in reducing anticipatory anxiety. Patients often fear the unknown, and detailed explanations of the extraction process, expected sensations, and post-operative care can demystify the procedure, lowering pre-surgical distress. The non-significant effect of Decision-Making Collaboration may reflect patients' preferences in oral surgery: many patients defer to clinicians' expertise for treatment decisions, viewing collaboration as less relevant than receiving clear information or emotional support. This aligns with clinical observations that patients prioritize trust in their surgeon's technical skills over active decision-making in invasive procedures.

The higher post-operative pain scores observed in patients with horizontal impaction confirm that surgical complexity influences pain, but the significant effect of communication skills even after controlling for impaction type demonstrates that communication is an independent modifiable factor. This is critical for clinical practice, as it indicates that improving communication can reduce pain even in more complex cases, where pharmacological interventions may have limited additional benefit.

4.2 Comparative Analysis with Domestic and International Research

This study's findings are consistent with international research on communication and pain in healthcare. International studies in general surgery have shown that emotional support from clinicians reduces post-operative pain intensity, even when controlling for surgical complexity—mirroring the strong correlation between Emotional Support and pain observed here. Similarly, international dental research has linked clear pre-operative information to lower patient anxiety and pain, supporting the role of Information Provision identified in this study. However, this study extends international research by focusing on the specific context of impacted wisdom tooth extraction, where pain is both acute and procedure-specific, rather than general surgical pain.

Domestic research on dental communication often centers on patient satisfaction rather than pain perception. Domestic studies have shown that better communication correlates with higher satisfaction, but few have quantified the link to pain. This study advances domestic research by providing empirical evidence that communication directly impacts pain outcomes, not just satisfaction. Additionally, domestic studies often use non-validated communication scales, whereas this study employs a validated instrument (CCSAS-OS), enhancing the reliability of findings. A notable difference from some international studies is the non-significant effect of Decision-Making Collaboration—international research in primary care often emphasizes collaboration as a key communication dimension, but this may not translate to oral surgery, where patients prioritize clinician expertise. This cultural or procedural difference highlights the need for context-specific communication research in dentistry.

4.3 Research Innovations and Limitations

The study's key innovations include: (1) a focus on the **temporal dynamics of pain perception**, measuring pain at three perioperative time points rather than a single post-operative assessment, providing a more comprehensive view of communication's impact; (2) the use of a validated, procedure-specific communication scale (CCSAS-OS), addressing the lack of standardized tools for assessing communication in oral surgery; (3) controlling for clinical factors (e.g., impaction type, surgical duration) in regression analysis, ensuring the observed communication-pain relationship is not confounded by surgical complexity.

The study also has limitations. First, its cross-sectional design cannot establish causality—while the correlation suggests communication reduces pain, it is possible that patients with lower baseline pain are more likely to rate communication positively (response bias). A longitudinal design or randomized controlled trial (e.g., training clinicians in specific communication skills and measuring pain outcomes) would strengthen causal inference. Second, pain assessment relies on self-reported VAS scores, which may be influenced by individual differences in pain tolerance or reporting bias. Integrating objective measures (e.g., physiological markers like heart rate variability, which correlates with stress) could complement subjective pain data. Third, the sample was limited to tertiary hospitals, excluding patients treated in private dental clinics or secondary hospitals—this may limit generalizability, as communication practices and patient demographics may differ across settings. Fourth, the study did not assess the duration or frequency of communication, only its quality—future research could explore whether longer or more frequent communication interactions yield greater pain reduction.

4.4 Clinical Practice Implications and Recommendations

Based on the findings, three key recommendations for clinical practice emerge. For oral surgeons and dental practitioners: (1) Prioritize Emotional Support during the perioperative period, particularly post-operatively. This includes acknowledging patients' discomfort, validating their concerns, and providing reassurance about recovery timelines—simple behaviors like saying, "Your

post-operative pain is normal and will improve in a few days" can reduce perceived pain intensity. (2) Enhance Information Provision with structured, patient-friendly explanations. Clinicians should use visual aids (e.g., X-ray diagrams) to explain impaction type and surgical steps, and provide written post-operative guidelines to reinforce verbal information—this addresses the pre-operative anxiety that contributes to pain perception.

For healthcare institutions and dental education programs: (1) Develop targeted communication training programs that focus on Emotional Support and Information Provision. Training should include role-playing exercises simulating common patient concerns (e.g., "Will the extraction hurt?") and feedback from patients to refine skills. Many dental curricula currently include only basic communication training; integrating scenario-based training specific to oral surgery can better prepare clinicians. (2) Incorporate communication skill assessment into clinical performance evaluations. Just as technical skills (e.g., surgical technique) are evaluated, communication skills should be measured using tools like the CCSAS-OS, incentivizing clinicians to prioritize interpersonal care.

For policy and guideline development: (1) Update clinical practice guidelines for impacted wisdom tooth extraction to include communication as a component of pain management. Current guidelines focus on pharmacological interventions and surgical technique; adding communication recommendations would align with patient-centered care standards. (2) Support research into the cost-effectiveness of communication training—improved communication may reduce post-operative visits for pain-related concerns, lowering healthcare costs while enhancing patient outcomes.

5. Conclusion

This study systematically investigates the relationship between clinicians' clinical communication skills and patients' pain perception during impacted wisdom tooth extraction, using rigorous methods including validated assessment tools, multi-timepoint pain measurement, and controlled statistical analysis. Key findings include: (1) Clinicians' overall communication skills are negatively correlated with patients' perioperative pain perception, with a moderate effect size ($r=-0.418$); (2) Emotional Support and Information Provision are the key communication dimensions driving this relationship, with independent predictive effects on pain scores ($\beta=-0.294$ and $\beta=-0.226$, respectively); (3) Decision-Making Collaboration and Response Timeliness do not significantly influence pain perception, reflecting the context-specific nature of effective communication in oral surgery; (4) The communication-pain relationship holds even after controlling for clinical factors like impaction type, confirming communication as a modifiable factor for pain management.

These results confirm that improving clinical communication skills—specifically Emotional Support and Information Provision—can effectively reduce patients' subjective pain perception during impacted wisdom tooth extraction. The findings underscore the need to integrate communication into pain management strategies in oral surgery, moving beyond a sole focus on pharmacological interventions. Future research should address the study's limitations through longitudinal or randomized designs, and explore how communication interacts with other non-pharmacological approaches (e.g., relaxation techniques) to enhance pain control. Ultimately, this study contributes to advancing patient-centered oral healthcare by demonstrating that interpersonal care is as critical as technical expertise for improving patient pain outcomes.

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