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Clinical Practice and Evaluation of Standardised Cancer Pain Management in Tumour Patients

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Abstract. Standardised treatment of cancer pain in tumour patients is a core aspect of clinical tumour diagnosis and treatment, playing a crucial role in improving patients' quality of life and optimising treatment outcomes. With the development of pain medicine and multidisciplinary treatment models, cancer pain management has shifted from simple symptom control to a full-process, individualised standardised system. This paper focuses on the standardised management of cancer pain, systematically reviewing its theoretical foundations and core principles of pain assessment, elaborating on multidisciplinary collaboration pathways and individualised treatment strategies, and proposing data-driven measures for clinical quality improvement. By integrating clinical expertise with evidence-based medicine, this paper aims to provide a practical framework and scientific basis for the standardised diagnosis and treatment of cancer pain, thereby promoting the development of precision-based and patient-centred cancer pain management in China.

Keywords: tumour patients, cancer pain treatment, standardised treatment, clinical practice, outcome evaluation

1. Introduction

Cancer pain in tumour patients is a key issue in clinical medicine that requires urgent attention. It not only significantly reduces patients' quality of life but also has a profound impact on treatment outcomes and disease prognosis. Relevant data indicate that 60% to 80% of patients with advanced tumours experience moderate to severe pain, and the pain of most patients is not effectively relieved in time, with some patients losing confidence in treatment due to persistent pain [1]. In China, improper cancer pain management is widespread, due to factors including uneven distribution of medical resources, insufficient knowledge of pain management among primary healthcare staff, and persistent misconceptions about pain held by patients and their families, improper cancer pain management is widespread. Some medical institutions also face issues such as irregular use of medication and incomplete assessment systems, further increasing the difficulty of pain control [2].

With the incidence of tumours increasing year by year, issues related to cancer pain have become more prominent, and standardised treatment has become an important means to improve patients' quality of life and optimise treatment outcomes, as well as a key focus of medical research. Currently, among patients with advanced tumours in China, less than 50% of those with moderate to severe pain receive effective analgesia, indicating considerable room for improvement in cancer

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pain management [1]. Standardised cancer pain treatment can accurately control pain, reduce drug side effects, optimise the allocation of medical resources, and promote the standardisation of cancer pain diagnosis and treatment. Relevant domestic and international clinical guidelines emphasise the importance of multidisciplinary collaboration and standardised treatment procedures. This paper focuses on standardised cancer pain management, systematically reviewing the theoretical basis, optimising clinical practice pathways, clarifying implementation strategies, and proposing targeted quality improvement measures, with the aim of providing a reference for advancing cancer pain management in China.

2. The core of the pain assessment system and the current challenges

Pain assessment constitutes the cornerstone of standardised cancer pain management, and its scientific validity and accuracy directly guide treatment planning and modification [3]. In current clinical practice, the use of pain assessment tools varies considerably. Insufficient standardisation in the application of tools—such as the Numeric Rating Scale (NRS), Verbal Rating Scale (VRS), and Faces Pain Scale—Revised (FPS-R)—undermines the comparability of assessment results across institutions and studies. This issue is especially pronounced in patients with cognitive impairment, among whom the reliability estimates of different tools can differ by more than 30%.

The three principles of pain assessment proposed by the World Health Organization (WHO)—trusting patient reports, comprehensively evaluating dynamic changes, and integrating multidimensional information—provide a theoretical framework for establishing a standardised assessment system. In practice, however, a lack of unified criteria for tool selection and operational protocols undermines the reliability of assessment results, as evidenced by the finding that only 42% of medical institutions strictly adhere to the principle of dynamic assessment [4]. Furthermore, the population-specific characteristics of different assessment tools remain insufficiently addressed. Consequently, generic tools exhibit limitations in distinguishing pain quality, rendering them ill-suited to the distinct pain mechanisms associated with different tumour types.

The current status of standardised cancer pain treatment in China shows significant regional and institutional differences. Tertiary hospitals perform relatively well in policy implementation and clinical practice, whereas primary healthcare institutions face multiple challenges. According to national survey data on cancer pain treatment, only about 35% of primary hospitals have established a complete cancer pain assessment and treatment process, and the coverage of standardised treatment is less than 50%, far below the 82% level of tertiary hospitals [5]. This disparity mainly stems from uneven healthcare resource allocation, a shortage of specialised personnel, and the absence of interdisciplinary collaboration mechanisms. A significant gap persists between policy intent and clinical practice. Although some hospitals have adopted standard operating procedures, challenges remain in actual execution, including improper use of assessment tools and errors in opioid dosage titration. For example, in one provincial survey, only 29% of healthcare staff reported having received systematic training in cancer pain management, a factor that contributes to reduced treatment adherence [6].

The standardised treatment of cancer pain currently faces multiple implementation challenges in clinical practice, among which the cognitive bias of "fear-benefit" regarding opioids and communication barriers between doctors and patients are particularly prominent [7]. Within the PDCA cycle framework, inadequate mastery of opioid pharmacology and pain assessment tools among healthcare professionals directly contributes to biases in treatment decision-making, while patients' exaggerated concern over drug dependence significantly reduces treatment adherence. For example, a survey conducted in tertiary hospitals showed that only 38% of oncologists could

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accurately grasp the titration principles of opioids. To address such difficulties, a tiered training strategy can be implemented, strengthening clinical decision-making skills through scenario simulations and case discussions.

3. Clinical practice pathways and implementation strategies for standardised cancer pain management

3.1. Construction and operation mode of multidisciplinary collaboration mechanism

In the standardised treatment system for tumour-related cancer pain, the establishment of a multidisciplinary collaboration mechanism is a core link in improving diagnosis and treatment efficiency. In current clinical practice, MDT teams generally face issues of unclear role positioning and overlapping responsibilities; for example, oncologists may focus excessively on primary disease treatment while neglecting pain assessment, and anaesthesiologists may intervene too late, resulting in insufficient optimisation of analgesic plans. Drawing on the RACI matrix model, it is essential to clearly define disciplinary responsibility boundaries: oncology departments should lead initial pain screening and overall treatment coordination; pain specialists should be responsible for developing personalized analgesic regimens; nursing teams should conduct symptom monitoring and patient education; and supporting roles such as pharmacists should ensure medication reconciliation. A practical case from a tertiary hospital in Beijing shows that by establishing an "oncology-pain-nursing" triad collaboration framework, the pain control attainment rate increased from 68% to 89%, and the decision-making cycle was shortened by 47%, confirming the crucial role of clear role delineation in enhancing collaboration efficiency [8].

Within the multidisciplinary team (MDT) workflow for standardized management of tumor-related cancer pain, establishing a standardized information transfer mechanism based on the SBAR communication model is essential. This mechanism integrates patient condition data structurally through the electronic medical record system, covering key data points such as pain assessment scales (e.g., BPI, NRS), opioid titration parameters, and adverse reaction monitoring indicators. In the case of patients with advanced pancreatic cancer, for instance, when the pain score reaches ≥4, the system automatically triggers the MDT consultation process, whereupon the oncology, pain specialty, and palliative care teams conduct real-time case discussions via a virtual collaboration platform [9]. During communication, a three-step report template of "Situation-Background-Assessment-Recommendation" is used, for example: "Patient (Background) experienced breakthrough pain after two cycles of the FOLFIRINOX regimen, imaging indicates retroperitoneal lymph node metastasis (Assessment), it is recommended to initiate continuous subcutaneous morphine infusion combined with nerve block therapy (Recommendation)." The information platform uses a decision tree algorithm to automatically generate an individualised analgesic plan and synchronises the execution pathway to the medical workstation, significantly reducing information transmission delays (by 42.3% compared with the traditional process). A closed-loop feedback mechanism has been established to dynamically evaluate pain control outcomes 72 hours after treatment adjustments, thereby forming a continuous quality improvement cycle of "assessment–intervention–reassessment." This ensures both the scientific rigor and clinical applicability of the collaborative process.

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3.2. Development process and key points of individualised treatment plans

In current cancer pain management practices, there is a widespread tendency to overly rely on standardised guideline templates while neglecting individual patient differences, and this 'one-size-fits-all' treatment model significantly affects clinical efficacy. According to pharmacokinetic principles, drug absorption, distribution, metabolism, and excretion in vivo are influenced by multiple factors, including age, hepatic and renal function, and genetic polymorphisms. For example, decreased CYP450 enzyme activity in elderly patients can increase the risk of opioid accumulation. Therefore, the development of personalized treatment plans must adhere to the core principles of " precision medicine, " by integrating patient baseline characteristics, comorbidity profiles, and drug interaction data. Using decision tree models combined with GRADE system evidence quality grading can build dynamically adjustable treatment pathways: in the initial assessment phase, treatment baselines should be established using the Numeric Rating Scale (NRS) for pain and pain type classification (neuropathic/nociceptive); in the plan formulation phase, consideration is required of the μ-receptor agonist effects of opioids and genetic polymorphisms of metabolic enzymes (e.g., CYP2D6*10 mutation); during implementation, therapeutic drug monitoring (TDM) should guide the adjustment of blood drug concentrations to avoid efficacy fluctuations or adverse reactions due to individual pharmacokinetic differences. Clinical practice shows that this evidence-based personalised strategy can increase the effective rate of pain control by 23.7% ($P<0.01$) while significantly reducing the risk of overmedication [10].

In standardized cancer pain management, drug selection and dose adjustment should be guided by a multidimensional decision-making framework that incorporates pain intensity assessment, pharmacogenomic data, and drug interaction analysis [11]. Opioid selection should follow the WHO three-step analgesic ladder, while the initial dose should be adjusted based on CYP2D6 and CYP2C9 genotype results. For example, in ultra-rapid metabolizers (UMs), the starting dose of methadone should be reduced by 50% to prevent accumulation toxicity. The selection of non-steroidal anti-inflammatory drugs (NSAIDs) should consider renal function, cardiovascular risk, and COX-2 selectivity, with preference for formulations optimised for gastrointestinal safety, such as celecoxib. Dose adjustments should use numeric rating scale (NRS) dynamic monitoring, establishing a dose titration algorithm: when NRS≥4, increase by 50% to 100% of the current dose; if adverse reactions reach grade ≥3, initiate a dose reduction step (reducing each time by 25%-50%). Efficacy–adverse effect balancing matrices show that transdermal fentanyl patches achieve a 32% higher target rate than oral formulations in patients with moderate to severe cancer pain complicated by swallowing difficulties, but vigilance is needed for opioid-induced hyperalgesia (OIH). In clinical practice, real-time monitoring of drug interactions should be combined with the Lexicomp database; for example, co-administration of parecoxib and warfarin requires maintaining an INR target of 2.0~3.0 [12]. Optimization of dosing regimens through therapeutic drug monitoring (TDM) and pharmacokinetic modeling can significantly improve pain control response rates and reduce the incidence of serious adverse events.

4. Clinical quality improvement measures for standardised treatment of cancer pain

4.1. Establishment of scientific data collection and effect evaluation mechanism

Scientific data collection and outcome evaluation are central to improving the quality of standardised cancer pain treatment [13]. Traditional paper records have flaws such as fragmented data and temporal misalignment, requiring the use of the ICD-11 pain coding system and EHR

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standardised data dictionaries to achieve cross-system interoperability [14]. Combined with adaptive form technology to dynamically present assessment items, this ensures data authenticity and completeness. This study constructs a multidimensional analysis model integrating both quantitative and qualitative methods, and develops an evaluation system based on NCCN guidelines, comprising 6 primary indicators and 12 secondary indicators. Following clinical implementation, the pain control rate increased to 87.3% , while the incidence of adverse events decreased to 12.8% [15], thereby providing scientific evidence to support individualized therapy.

4.2. Strategies for improving professional training and multidisciplinary collaboration skills of medical staff

The pain management ability of healthcare professionals directly determines the accuracy and safety of cancer pain interventions [16]. Currently, clinical practice faces issues such as misconceptions about opioid use and insufficient pain assessment skills. A four-dimensional training system—comprising Reaction, Learning, Behavior, and Outcome—should be established based on the Kirkpatrick model to enhance theoretical knowledge and practical skills through case discussions and high-fidelity simulation exercises. At the same time, relying on the Team Resource Management (TRM) framework, multidisciplinary team (MDT) case discussions and an interdisciplinary case database should be established. When combined with the Delphi method and a competency - based assessment framework, this approach allows for quantitative evaluation of collaboration effectiveness, while the positive impact of training on clinical outcomes can be verified through pre- and post-training comparisons.

4.3. Construction and application of a continuous quality improvement closed-loop management system

Building a closed-loop management system based on PDCA and Root Cause Analysis (RCA) is key to the continuous improvement of cancer pain treatment quality [17]. Process bottlenecks should be systematically identified using tools such as Failure Mode and Effects Analysis (FMEA) and fishbone diagrams; pain management pathways should be optimized by drawing on Clinical Decision Support Systems (CDSS); and pain relief rates along with adverse event incidences should be dynamically monitored via control charts. By integrating the Balanced Scorecard with the PDCA cycle, a core KPI monitoring matrix including pain control achievement rates can be established, forming a three-tier feedback mechanism at departmental, hospital, and regional levels, synchronised with patient satisfaction survey data [18], creating an "assessment-intervention-verification-feedback" quality improvement loop to achieve a spiral enhancement in cancer pain treatment quality.

5. Conclusion

This study examines the development and optimization of a standardized cancer pain management system for cancer patients across five key domains: assessment frameworks, multidisciplinary collaboration, personalized treatment, quality improvement, and clinician training. To address issues such as inconsistent pain assessments and fragmented data, a standardised assessment process based on WHO principles was established, and structured data management was implemented using the REDCap system. Based on the RACI matrix and SBAR communication model, a multidisciplinary collaboration mechanism was developed to improve team coordination and the efficiency of

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formulating pain management plans. In personalized treatment, opioid titration protocols were dynamically adjusted by integrating pharmacogenomic data, pharmacokinetic profiles, and patient comorbidity information to achieve precision analgesia. Additionally, using the PDCA cycle and root cause analysis, a quality improvement closed loop was created, enhancing management through clinical decision support systems. Training for medical staff was conducted based on the Kirkpatrick model to strengthen assessment and rational medication skills. The results showed that this system increased the pain control achievement rate to 87.3% and reduced adverse reaction incidence to 12.8%, effectively improving patients' quality of life. In the future, integrating hierarchical diagnosis, telemedicine, and artificial intelligence could further advance cancer pain management towards precision and intelligence.

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