

Supplementary Table S1: Characteristics of the participating hospitals and operating rooms in Wuxi, Jiangsu Province, China (N = 9 centres)

Centre ID	Hospital Type / Level	Number of Operating Theatres
1	Tertiary A (Grade 3A) General Hospital	36
2	Tertiary A (Grade 3A) General Hospital	31
3	Tertiary A (Grade 3A) General Hospital	30
4	Tertiary A (Grade 3A) General Hospital	27
5	Tertiary A (Grade 3A) Specialized Hospital	24
6	Tertiary A (Grade 3A) General Hospital	15
7	Tertiary A (Grade 3A) Specialized Hospital	14
8	Tertiary B (Grade 3B) General Hospital	12
9	Tertiary A (Grade 3A) Specialized Hospital	11

All participating centres were public hospitals located in Wuxi, Jiangsu Province, China.

Supplementary Table S2: Frequency of missed nursing care items (N = 391)

Item number	Subscale	Item	n (%) reported occasionally, frequently or always missed
1	Law	Nurse uses at least two patient identifiers to verify the patient's identity before entry into the operating theatre: identification wristband (name, gender, department, room number, medical record number, QR code) and the preoperative patient transfer checklist (diagnosis, procedure, accompanying items, surgical site marking)	16 (4.09)
2		Nurse asks the patient or patient's legal guardian to verify the surgical procedure (anesthesia methods, surgical procedures, and operators)	13 (3.32)
3		Nurse verifies that the surgical consent is signed, dated before surgery	24 (6.14)
4		Nurse verifies the correct surgical site is marked by the surgeon	20 (5.12)
5		Nurse verifies the patient's medical history and laboratory test results are complete and dated before surgery	25 (6.39)
6		Allergies are documented and reported to the surgical and anesthesiology teams	10 (2.56)
7		Verifying that questions from the patient and legal guardian regarding the procedure (e.g., surgical complications, pressure injury) have been addressed and that informed consent has been signed	32 (8.18)
8	Preparation	Comfortable psychological and basic care are provided to the patient	9 (2.30)
9		Inquiring with the patient and legal guardian about the presence of any internal implants, and notify the surgical team accordingly	9 (2.30)
10		Isolation precautions are implemented for patients with infectious diseases	18 (4.60)
11		Confirming the availability of cross-matched blood products and verify that the patient's identification information is accurate prior to surgery	4 (1.02)
12		Checking whether the patient is wearing graduated compression stockings during surgery	39 (9.97)
13		Before transferring the patient to the operating room, communicate with the surgical team to prepare all necessary supplies, instruments, and equipment, and establish a contingency plan for emergencies	18 (4.60)

Continued Supplementary Table S2: Frequency of missed nursing care items (N = 391)

Item number	Subscale	Item	n (%) reported occasionally, frequently or always missed
14	Safety	Patient is transferred to and from the OR bed without harm and positioned appropriately to prevent surgical complications	7 (1.79)
15		A single-use dispersive electrode is placed when monopolar electrosurgery is used	3 (0.77)
16		Nurse verifies that the surgical team strictly adheres to aseptic technique, intraoperative isolation protocols, and operating room policies and regulations	4 (1.02)
17		Nurse strictly adhere to the counting and verification protocol, master the timing of counts and perform timely documentation, check the integrity of instruments, and notify the surgeon immediately if any discrepancy is detected	3 (0.77)
18		Protecting the patient's teeth and conjunctiva, and preventing antiseptic solution from entering the eyes and ears during skin preparation	6 (1.53)
19		Collaborating with the surgical team to monitor the patient's vital signs	12 (3.07)
20		Nurse strictly adheres to the "Three Checks and Eight Verifications" protocol for intraoperative blood transfusion and controlled substance administration, and retain the blood bag and medication ampoules as required	0 (0.00)
21	Communication	Strictly implement the surgical safety checklist and preoperative time-out procedure, verifying the patient, surgical informed consent, procedure, and site before skin incision	1 (0.26)
22		The team waits 3 min for antiseptic skin prep solutions to dry	35 (8.95)
23		A standardized communication tool is used for tasks such as specimen handover and item counting	4 (1.02)
24		Perform timely counting and documentation during staff changes, and complete thorough handover	6 (1.53)
25	Postoperative routine	Nurse properly preserves surgical specimens, register and send them for pathological examination in a timely manner, and verify with double signatures to ensure accurate documentation	23 (5.88)
26		Nurse ensures that patient tubes are patent and properly secured, that restraints are applied appropriately, that patient privacy is protected, and that the patient is kept warm	27 (6.91)
27		Ensuring nursing records are completed promptly and accurately following surgery	34 (8.70)
28		After surgery, safely transfer the patient to the recovery room in conjunction with the surgical team, accurately verify patient details, and return any personal belongings, imaging materials, or unused medications	30 (7.67)

Supplementary Table S3: Reasons for Missed Care full item analysis (N = 391)

Item number	Subscale	Item	n (%) reported reasons for MNC
1	Urgency	Urgent clinical situations (e.g., a patient's condition worsening)	165 (42.20)
2		Unexpected changes in planned surgical procedure (such as modifications or additions to the surgical procedure)	152 (38.87)
3		A high volume of surgeries, a large number of patients, and patients with severe conditions	186 (47.57)
4		Insufficient nursing staff allocation makes it difficult to guarantee adequate shift rotation and rest periods	228 (58.31)
5	Staffing	A shortage of nursing team members, leaving no reserve personnel available when unexpected events occur during surgery	212 (54.22)
6		The problem of inadequate staffing cannot be resolved in the short term	222 (56.78)
7		Surgical team members have been in a state of chronic fatigue for an extended period	228 (58.31)
8		Nurses have limited professional competence and cannot independently collaborate with the surgical team to complete emergency procedures	171 (43.73)
9	Materials	There is a shortage of supplies, making it impossible to obtain adequate equipment, supplies, or instruments during surgery	195 (49.87)
10		Supplies are of low quality, and maintenance or replacement is not performed in a timely manner, resulting in surgical supplies, equipment, or instruments failing to function properly when needed	202 (51.66)
11		The number of ancillary nursing staff is insufficient, and communication with them is poor, making it impossible to transport patients promptly, clean the operating room, replenish supplies, or send pathological specimens in a timely manner	196 (50.13)
12	Teamwork	Poor communication with surgeons or anesthesia staff prevents timely awareness of changes in patient condition or modifications to the surgical procedure	171 (43.73)
13		There is a lack of trust among members of the surgical team (surgeons, anesthesiologists, and operating room nurses)	158 (40.41)
14		Surgical team members lack adaptability and are unable to collaborate effectively to manage intraoperative emergencies	163 (41.69)
15		Surgical interruptions, such as phone calls and unnecessary conversations, frequently disrupt the surgical process	162 (41.43)
16		Nurses' experience and habitual behaviors make some instances of missed nursing care difficult to detect	184 (47.06)