Digital Nursing Innovation for Safer, More Efficient, and Patient-Centered Care

From clinical needs to measurable nursing value

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Outline

From patient needs to safer care, workforce efficiency, and sustainable nursing value

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02 **Safer Care**
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03 **Smarter Care**
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04 **Better Outcomes**
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GLOBAL CONTEXT

Digital Health Is Reshaping Nursing Practice

Global strategies increasingly emphasize people-centered digital health and a digitally prepared nursing workforce.

WHO Digital Health Strategy

A policy framework for integrating digital solutions into stronger, more equitable health systems.

State of the World's Nursing 2025

Digital tools, workforce readiness and supportive work environments are linked priorities for the nursing profession.

The question is not simply which technologies we adopt, but what value they deliver in care.

CHINA POLICY

China’s Policy Context: From Guidance to Bedside Practice

National policy supports high-quality nursing, smart clinical workflows and responsible AI adoption.

2022

Nursing Development Plan

Quality improvement and nursing informatics.

2023

Nursing Services Action Plan

Smarter wards, digital workflows and patient experience.

2025

AI + Healthcare Guidance

Responsible application, safety and implementation.

Policy creates the environment; nurses translate it into safe and effective care.

NHC China: Nursing Development Plan 2021–2025; Nursing Services Action Plan 2023–2025; AI + Healthcare Guidance 2025



WORLD MAYORS DIALOGUE • LUOYANG 2026

LUOYANG

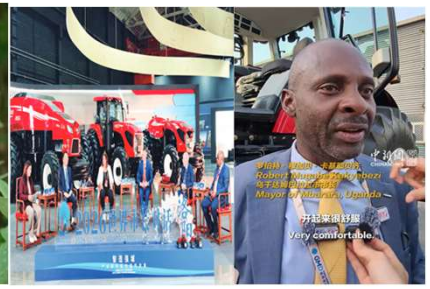
Luoyang, the ancient capital of thirteen dynasties .
Longmen Grottoes bear the craftsmanship of a thousand years.
Luoyi Ancient City revives the splendour of the Tang Dynasty through Hanfu costumes.
From here, YTO Dongfanghong tractors travel across the globe.
Ancient cultural heritage and modern manufacturing thrive side by side in this city.



Luoyi Ancient City • Hanfu Culture (traditional Han ethnic costumes)



Peony City — Luoyang, renowned as the hometown of peonies



YTO • Dongfanghong Tractor (China First Tractor Manufacturer)

河南科技大學 第一附属医院
THE FIRST AFFILIATED HOSPITAL OF HENAN UNIVERSITY OF SCIENCE & TECHNOLOGY

Our Hospital: A Clinical Setting for Nursing Innovation

A tertiary teaching hospital integrating clinical care, nursing education and research.

4,623
Open beds (reported)

4,575
Staff members (reported)

3
National key disciplines

Our focus: digital support for nursing safety, patient education and evidence-based interventions.

Start With Patient Needs — Not the Technology

Three recurring needs frame our case examples and their evaluation.

SAFER CARE

Accurate verification, timely alerts and a traceable care process

SMARTER CARE

Accessible education and more efficient allocation of nursing time

BETTER OUTCOMES

Support for anxiety, sleep and the patient experience

Patient need → nursing implementation → measured outcome

SAFER CARE

Safer Care: What Can Digital Verification Address?

Bedside safety requires the right patient, right medication and a reliable record of execution.

Clinical problem

Changing orders, manual transcription and fragmented information create opportunities for missed checks.

Digital response

Connected orders, patient wristband scans, medication barcodes and alerts at the bedside.

Evidence boundary

The source documents workflow functions; it does not establish a reduction in medication error rates.

Digital verification supports — and never replaces — mandatory professional nursing checks.

How Bedside Verification Works in Five Steps

A traceable medication administration workflow, grounded in the hospital implementation materials.

01

Review

Verify the active order

02

Identify

Scan patient wristband

03

Match

Scan medication barcode

04

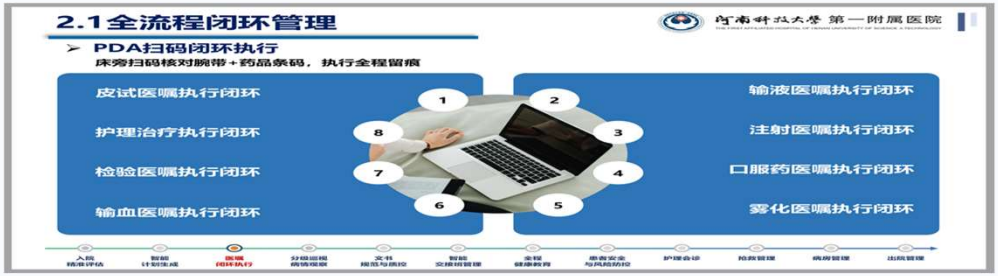
Check

Perform required nursing checks

05

Record

Document and trace execution



Smart Alerts Turn Order Changes Into Actionable Tasks

Digital prompts support timely verification of urgent orders and high-alert medications.

What the system does

Synchronizes order changes, generates urgent-order notifications and flags selected high-alert medications.

What nurses do

Review alert context, conduct the required independent checks, assess the patient and document action.

Clinical value: timely prompts, standardized checking and improved traceability — not proven error-rate reduction.

SAFER CARE · EVALUATION

Safety: What We Have Implemented — and What Still Needs Measuring

Separate confirmed system capabilities from outcomes that require prospective measurement.

Implemented in practice

- Bedside wristband and medication scans
- High-alert medication prompts
- Electronic execution records

Priority outcome measures

- Barcode compliance and override rates
- Near-miss and medication-error trends
- Documentation burden and alert fatigue

SMARTER CARE · IMPLEMENTATION

Smarter Care: Digital Patient Education as a Nursing Workflow

Nurses identify educational needs, assign digital content and assess understanding.

01

Identify

Patient education need

02

Assign

Choose relevant content

03

Deliver

Digital human or bedside display

04

Assess

Nurse checks understanding

05

Document

Record education and follow-up

The nurse remains accountable for content accuracy, personalization and patient response.

SMARTER CARE · IMPLEMENTATION

Robot-Assisted Patient Education: From Task to Delivery

A practical example of task support rather than nurse replacement.

01

Select

Choose patient/bed

02

Prepare

Select education content

03

Schedule

Add to task plan

04

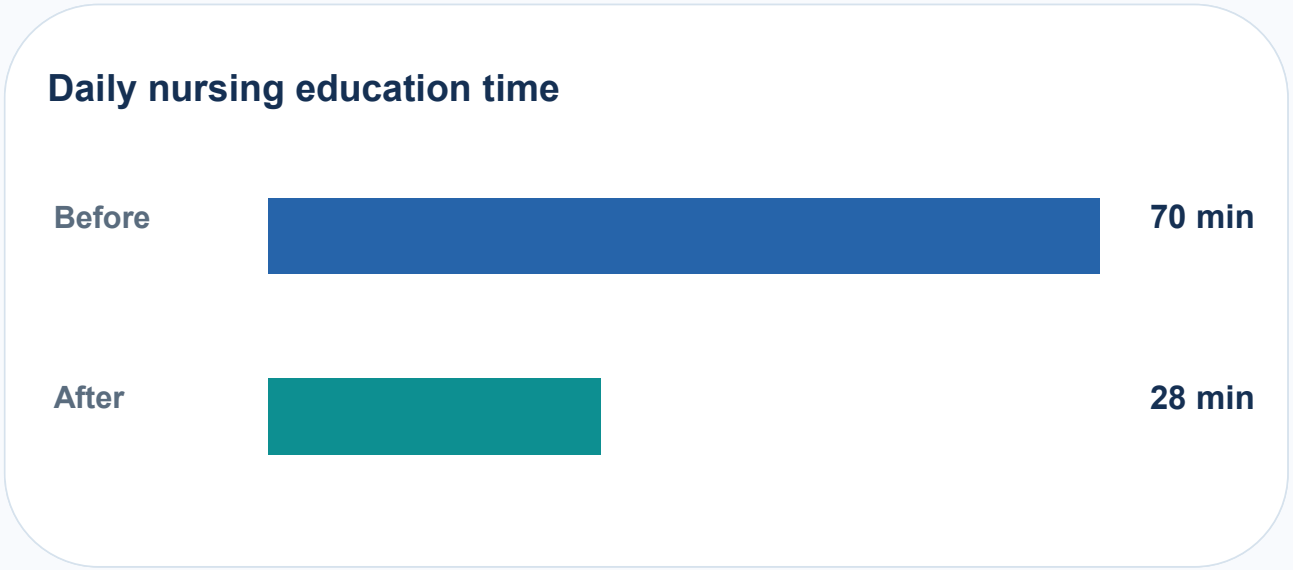
Review

Check completion status



Workforce Efficiency: A Reported Reduction in Education Time

Hospital VTE/ankle-pump education case: descriptive before–after comparison.



60%

Less reported staff time

Interpretation: one task and one local workflow; no demonstrated full-workforce productivity or net cost savings.

BETTER OUTCOMES · PATIENT NEED

Better Outcomes: Addressing Anxiety and Sleep Before Cardiac Surgery

The uncertainty of surgery can create psychological and sleep-related needs that education alone may not resolve.

Anxiety

Fear of the procedure, unfamiliar environments and perceived surgical risk.

Sleep disruption

Emotional distress and preoperative sleep problems can reinforce one another.

Our response

Staged VR orientation and nature-based breathing relaxation.

Study Design: A 70-Participant Randomized Controlled Trial

Prospective, parallel-group single-center trial; intervention added to usual preoperative nursing care.

n = 70

Eligible adults

VR + usual care

Intervention arm

Usual care only

Control arm

Primary: anxiety (STAI), subjective sleep (PSQI) | Supplementary: wearable-estimated deep sleep

Exactly What Patients Received: Three Staged VR Sessions

The exposure and relaxation content was adjusted as the date of surgery approached.

T1

After surgical decision

2-minute team/OR orientation
+ 16-minute nature-based breathing

18 min total

T2

One day before surgery

4-minute simulated surgical journey
+ 16-minute breathing relaxation

20 min total

T3

Preoperative waiting area

16-minute breathing relaxation
(no new surgical exposure)

16 min total

What We Measured — and When

Patient-reported outcomes were combined with wearable-estimated sleep metrics.

STAI

Preoperative anxiety; four reported assessments

PSQI

Subjective sleep; three time points in supplied Table 2

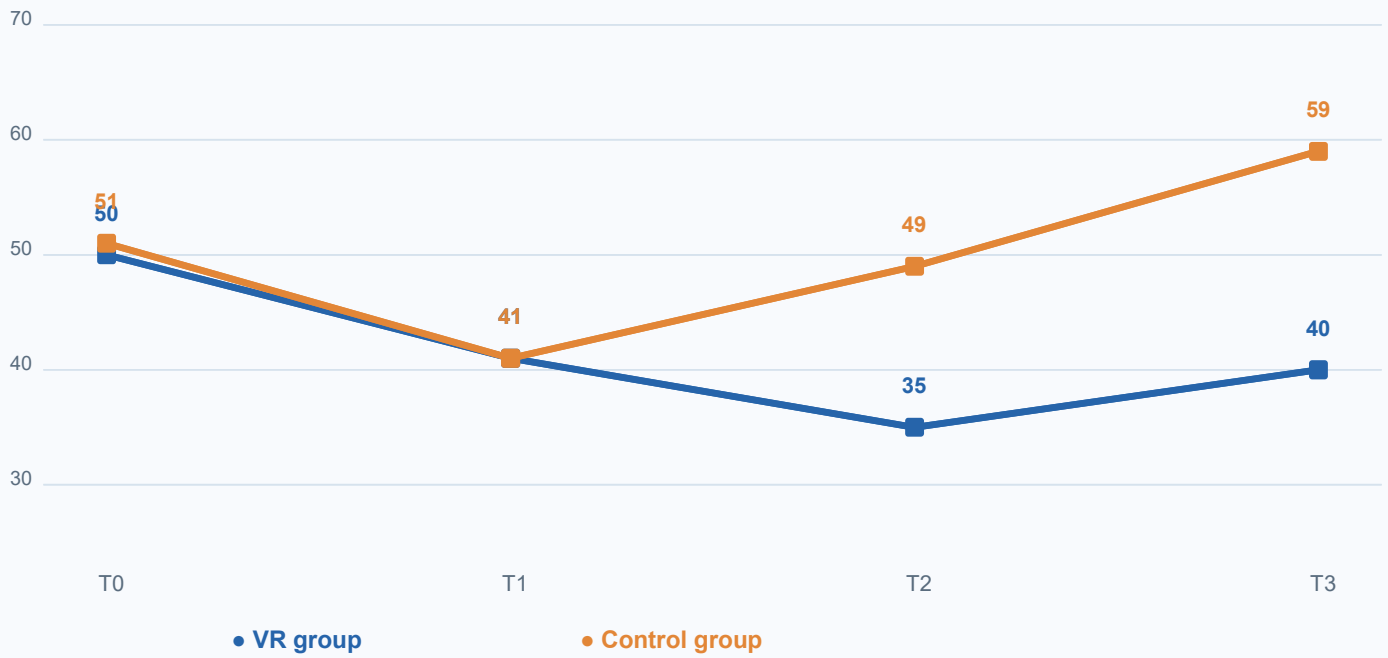
Wearable

Deep sleep duration; three time points in supplied Table 3

Data note: the manuscript contains inconsistent T3/T4 descriptions; reconcile with the trial dataset before presenting.

Anxiety: Separation Between Groups Emerged Before Surgery

STAI medians across reported assessment points; lower scores reflect less anxiety.



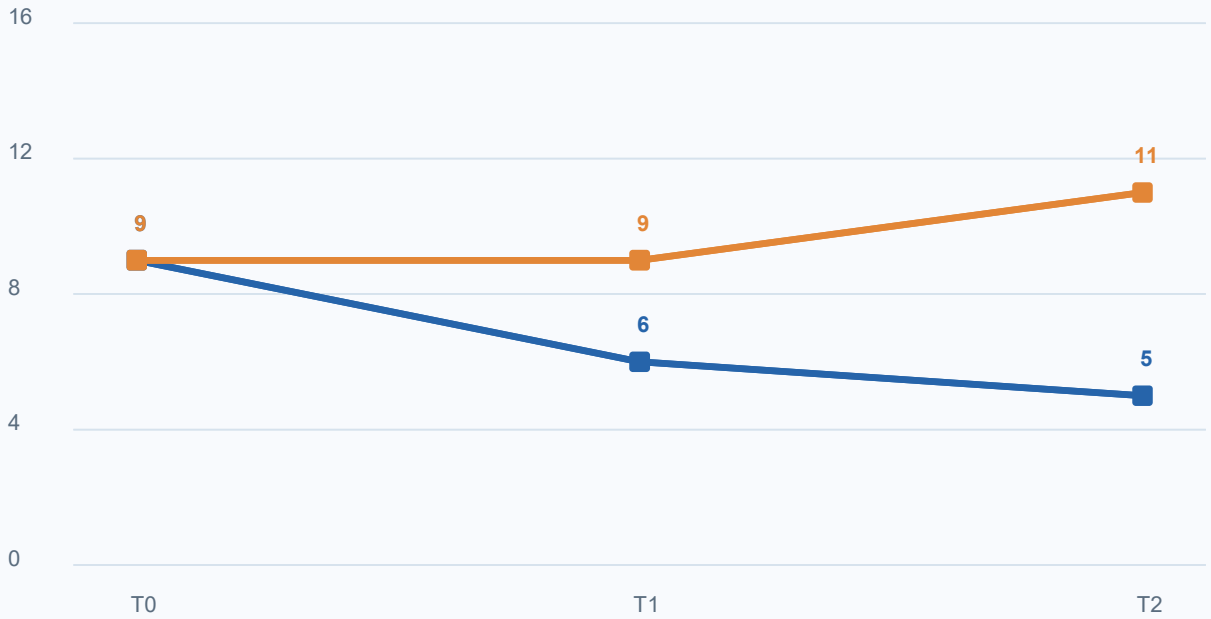
$\chi^2 = 52.980$

$p < 0.001$

Group × time interaction

Sleep: Subjective Improvement, Objective Uncertainty

The subjective and wearable-based results should not be presented as equivalent evidence.



PSQI: lower scores indicate better subjective sleep quality.

PSQI interaction

$\chi^2 = 15.116$ | $p < 0.001$

Wearable deep sleep

No significant between-group difference at any reported time point.

Economic Resilience: What Should We Measure Next?

Economic resilience requires assessing both the benefits and the resources needed to sustain digital nursing.

INPUTS

Equipment purchase, maintenance, staff training, IT support and nursing time.

PROCESSES

Adoption, task completion, staff workload, verification quality and service reach.

OUTCOMES

Patient safety, experience, clinical outcomes and cost per beneficial outcome.

Measured locally: education time for one task. Not yet measured: cost-effectiveness or financial return.

KEY TAKEAWAYS & DISCUSSION

What Should Digital Nursing Deliver?

Patient needs → nursing implementation → credible evidence of value

Safer Care

Barcode checks and alerts support more reliable, traceable nursing processes.

Smarter Care

Robot-assisted education offers a measurable workflow-efficiency example.

Better Outcomes

Staged VR shows benefits for selected patient-reported outcomes, with limitations.

DISCUSSION: How can digital nursing improve workforce efficiency while remaining safe, equitable and financially sustainable?

Thanks for your attention!







