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## 2P Safety Hospital Technology for Healthcare

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### INTRODUCTION

From 2019 to 2023, HAI implemented innovative technology projects focused on patient safety in public health. The "2P Safety Tech," in collaboration with the National Science and Technology Development Agency (NSTDA), coordinated personnel and hospitals to develop technologies aimed at preventing incidents related to hospital care processes. These innovations were designed to address the specific challenges hospitals face, with a focus on achieving patient and personnel safety goals (SIMPLE) in 12 key areas.

"Human error is inevitable because everyone has the potential to make mistakes." HAI (Healthcare Accreditation Institute) in Thailand emphasizes solving problems to support system development. Technology and innovation play a crucial role in closing gaps in safety, adhering to the principles of human factors engineering.



Piyawan L., et al. (2018). 2P Safety Goals for Patients and Personnel in Thailand.

### AIM

- To support the development of healthcare systems by leveraging technology and innovation to address and solve existing challenges by applying the principles of human factors engineering
- To implement tailored technologies that align with the specific needs of each hospital to enhance safety and operational efficiency.

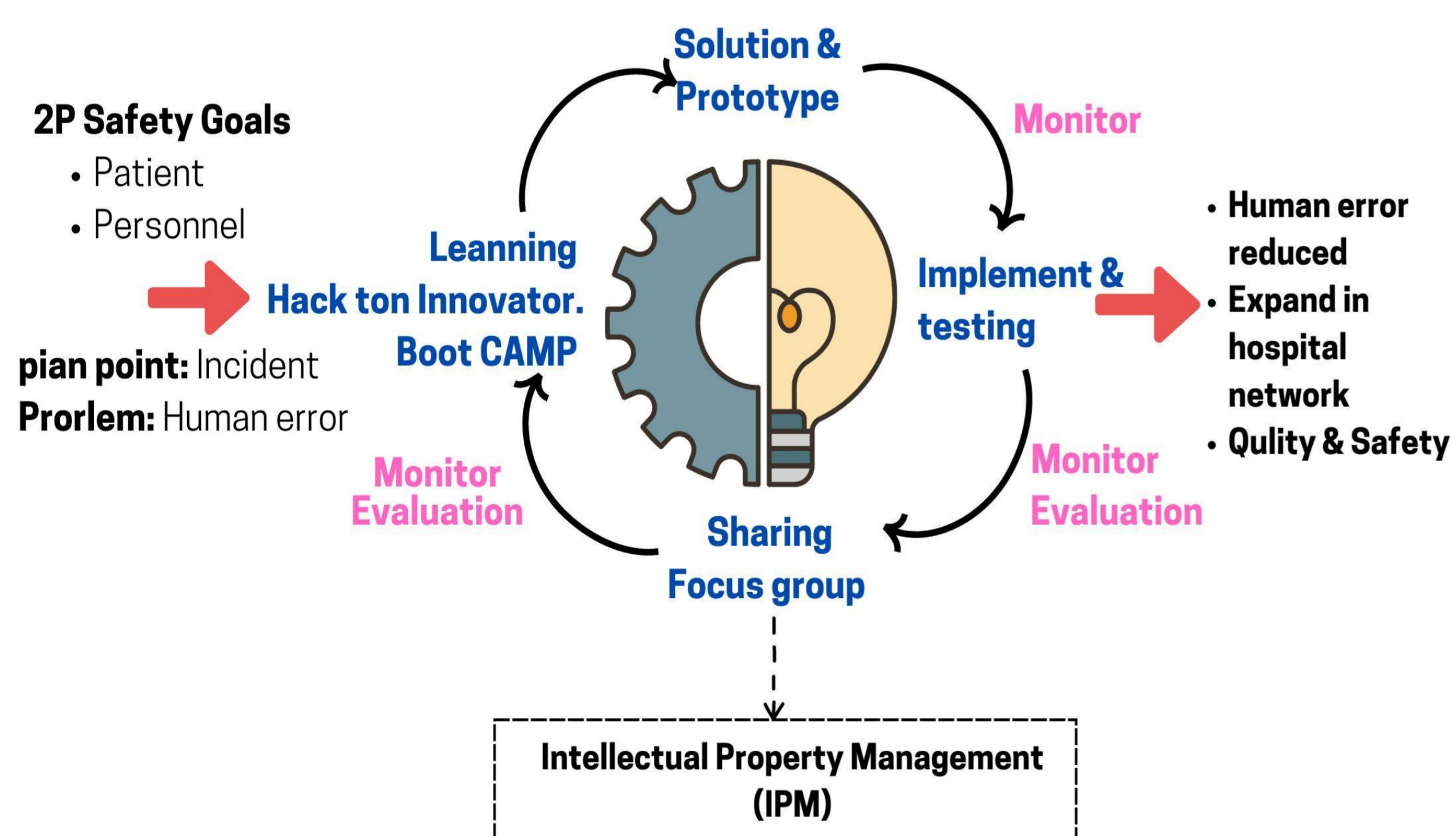
### METHOD

The development process, in collaboration with NSTDA, focused on fostering a safety culture through learning initiatives such as:

- Learning from incidents to expand innovations that can prevent risks in healthcare facilities.
- Developing a safety innovations curriculum, including root cause analysis and problem-solving through innovation.

#### Developer Framework

##### Human Factor Engineering



#### Study on Innovation Development in Hospitals

- Study Design:** The study employed a descriptive and testing approach, incorporating focus group discussions and phenomenological observations during surveys and seminars.
- Innovation Sampling:** The most developed innovations centered on improving patient care processes, with a focus on medical and blood safety, as well as emergency response.
- Reliability Testing:** Both NSTDA innovation teams evaluated the hospital testing process based on established hospital standards and medical device guidelines.
- Validity and Sensitivity Testing:** Focus group workshops were conducted to facilitate discussions and exchange opinions on testing results between the innovator teams, experts, and observers.

### RESULTS

Between 2019 and 2024, hospitals were required to submit their work to participate in the project. Out of 200 submitted projects, 40 were further developed into practical prototype innovations capable of solving real-world problems, and 10 innovation project were selected to pilot implemented. One of these projects involved transferring technology to hospitals nationwide, expanding the reach to hospital networks supported by research. This effort led to multiple patents and certifications across three key projects. The most developed innovations focused on improving patient care processes, medical and blood safety, and emergency response.

The majority of innovations developed were aimed at improving patient care processes, medical and blood safety, and emergency response. For example:

- Two problem-solving innovations were tested and yielded positive results.
- Continuous development and improvement of the hospital model, with volunteers serving as mentors in patient care processes, have significantly supported Thai public health services. This initiative has reduced inequality, increased access to care, decreased healthcare personnel workload, and helped prevent the recurrence of risks associated with adverse events.

#### Example 1: Innovation in Sepsis Management

- Action Plan Timeline:** September 2022 - December 2023
- Application:** Application alert SOS Score for sepsis
- Result:** The emergency response system, including the SOS score for sepsis management, was tested in a public hospital.
  - Pain Point:** High mortality rate due to septic shock within 24 hours, with a 66% death rate in 2021.
  - Problem:** Delayed diagnosis, under-detection, and complications due to limited experience of healthcare providers.
  - Outcome:** The SOS score effectively reduced the identified pain points and problems associated with sepsis management.



	Before Application Time Average	After Application Time Average
Time to Triage	25.3 min.	12.82 min
Time to Diagnosis: SEPSIS	13.2% min.	1.30 min
IVF in 1 hr.	51.69 min	15.05 min
Door to ATB in 1 hr.	30.8 min	15.20 min
% SOS Score	30.8%	100%
Sepsis Mortality Rate	27.11%	26.30%

#### Before and After Application - Time Metrics

##### Example 1: Innovation in Sepsis Management

- Before Application:** The average time for detecting and diagnosing sepsis was delayed, contributing to a 66% mortality rate within 24 hours.
- After Application:** The application of the SOS score reduced the average response time, improving early detection and decreasing complications.

#### Example 2: Innovation in Blood Transfusion Safety

- Action Plan Timeline:** September 2022 - December 2023
- Application:** Blood Transfusion Patient Identification
- Result:** The patient care process and medical and blood safety were tested in a large hospital. The hospital handled an average of 24,030 blood transfusions per year, with 55,000 blood packs used in 2023-2024.
  - Pain Point:** Incorrect blood component transfusion, with two deaths reported in the past two years.
  - Problem:** Errors in identification, issues with double-checking, and high Improvement Metrics.
    - Before:** Goal achievement: 100%, Time reduction: 50%, Process efficiency: 60%
    - After:** Output achievement: 100%, Time reduction: 81.5%, Process efficiency: 93.5%
  - Outcome:** The safety of blood transfusion processes improved, with a significant reduction in errors related to wrong blood transfusion.



	Problem	Identify	Reduce time	Reduce process	Confidence
Before: Goal	100%	50%	60%	Up Level	
After: output	100%	81.5%	93.5%	Up Level	

#### Before and After Application - Time Metrics

##### Example 2: Innovation in Blood Transfusion Safety

- Before Application:** The average time taken for the blood transfusion process was 50% longer, with only 60% of the process efficiency goal being met.
- After Application:** The average time required for the blood transfusion process was reduced by 81.5%, significantly improving process efficiency to 93.5%.

### CONCLUSIONS

The ongoing efforts to enhance and refine hospital models, with volunteers serving as mentors across 10 key projects—including patient care processes, medical and blood safety, and emergency response—have significantly supported Thai public health services. This initiative has played a crucial role in reducing healthcare inequality, increasing access to care, and substantially decreasing the workload of healthcare personnel, while also preventing the recurrence of risks associated with adverse events. Moving forward, efforts will focus on enhancing the clarity of analysis and testing, ensuring that innovations align with medical device standards and healthcare guidelines. The ultimate goal is to develop solutions that mitigate human error, thereby improving the quality and safety of care for both patients and personnel.

### ACKNOWLEDGEMENT

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