Project name

**Seamless Total Safety:**

*Mobile Intelligent Chemotherapy Medication Administration*

Organization name and location

*Cathay General Hospital, Taipei, Taiwan/ROC*

Team leader name and contact information

*Ming-Chuan Jessie Kuo, RN, MS*

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Team member names (up to seven)

1. **Polun Chang, PhD, Professor (Project Consultant)**
2. **Yung-Chuan Sung, MD, Director, Division of Hematology & Oncology**
3. **Shwu-Ying Wu, Pharm., MS, Leader, Division of Pharmacy**
4. **Wen-Chen Juan-Lu, RN, Head Nurse, Hematology & Oncology Ward**
5. **Chia-Hui Chu, RN, Nursing Informatics Specialist**
6. **Cheng-Yuan Chen, Leader, Information Management Department**
7. **Wei-Kang Shih, Engineer, Information Management Department**

Project goals

To design a Safe Electronic Chemotherapy Medication Administration (SECMA) support system by

1. **Reengineering the entire chemotherapy medication process from a total perspective back to prescription and dispensing,**
2. **Implementing a “strong but less-burden” double check safety intervention,**
3. **Solving the problem of lack of data interoperability of infusion pumps,**
4. **Demonstrating the potentials of mNursing, Nursing with Mobile Devices, with handheld mobile devices.**
1. Technology or informatics intervention

(1) Device Used: The mobile device used in this project: the 6” Wifi Android MioPad Ares 100 Mobile handheld device with 1D barcode reader. The device could be easily held with one hand and fit into the pocket of nurse’s robe, cleaned with alcohol, spark proof and rugged proof.

(2) HIS, CPOE, PIS and NIS: All systems have been homemade and maintained. Related components of CPOE, Pharmacy Dispensing system with barcodes, and NIS were all recoded based on reengineering results. A Web service was designed to support mNursing with HIS/NIS.

(3) mNursing App: The first of its own kind app for mobile chemotherapy medication administration was homemade, as shown in Figure 1.

(4) mDoubleCheck Module: An imaging process module was developed to read and recognize all key data on the infusion pumps to solve the problem of lack of data interoperability from pumping devices. The old two-nurses-double-check safety intervention was then replaced with the mDoubleCheck.

2. Implementation and workflow change

(1) The Reengineering: The project started from examining the old entire chemotherapy medication administration process. Problems were found: (i) information was kept separately on various kind of paper forms, (ii) four two-nurses double checks costs lots of time, (iii) pumping data entered in CPOE were in free format and costs nurse to calculate the rates by hands, (iv) no administration records, and (v) many patient rooms were inaccessible by current mobile cart, installed with single-purpose barcode. Figure 3 shows the problems identified in process analysis and some problems were shown in Figure 4-6.

(2) The reengineered process is shown in Figure 7, which consists of 8 designs of (i) the modified CPOE interface in which all data were entered in a structured way; (ii) introduction of barcodes for all safety checks, (iii) automatic calculation of pumping rates and volumes, (iv) install of mDoubleCheck module, (v) mNursing nursing and administration records, (vi) supporting point of care at bedside, (vii) preparing all key information handy such as
response SOPs for accidents, and (viii) automatically reminding nurses for next run of administration.

(3) A multiprofessional team, composed of 15 from various departments, was set up for the mNursing. The team was responsible for requirement analysis, nursing staff education, implementation preparation, implementation evaluation, and implementation supports.

(4) The new process was formally standardized as the Chemotherapy Medication Administration SOP in hospital QA Management System.

(5) Key components of mNursing, compared to the old practice, is shown in Figure 8.

3. Organizational Strategy

(1) The total quality control concept and reengineering process were used to assure the quality of project.

(2) A multiprofessional team was organized which composed as many as 15 members from 5 different institutes and departments.

(3) Project management was used to manage the success of project in terms of cost, time and designs.

(4) Evaluation was predesigned to measure the effectiveness of project.
Figure 1. The operation structure of the mNursing app for chemotherapy medication administration.
Figure 2. Screenshot of mDoubleCheck which relies on the imaging processing to read and recognize all data on infusion pumps.

Figure 3. Flow of the original chemotherapy medication process was analyzed and problems identified, which were labeled with numbers.
Figure 4. Two-nurse double checks with the Unit Preparation before improvement.

Figure 5. Two-nurse double checks with the Unit Administration before improvement.

Figure 6. Patient rooms were inaccessible by mobile carts.
Figure 7. The reengineered chemotherapy medication process. The blocks in Yellow means the original manual process was replaced with the system; Blocks in pink are the process simplified or removed; Blocks in blue is the mDoubleCheck module; Blocks in green are supported with decision support module; and Block in red is the our original design.
Figure 8. Demonstration of mNursing, right, compared to the old practice, left. Key improvement is no more burdens of two-nurse double checks and manual documentation.
4. Measurable benefits

(1) **Time saved.** The new average time for chemotherapy medication administration for nurses was 4'46", compared to 24'51" in old practice. This stands for a significant improvement of 81%. An estimate of a total of 288 nurse day could be saved each year.

(2) **Effectiveness of mDoubleCheck.** The recognition correctness of mDoubleCheck was 100% with an average recognition time of 1.63 second on pumping rate data and 1.50 second on volume data. Two-nurse double checking practice is still recommended mostly\(^1\). The strength of this safety intervention was questioned\(^2\), compared to the high-strength design of our mDoubleCheck, in which independent IS checking, forcing checking and process constraints are relied to guard the safety of all key information and process.

(3) **Patient satisfaction** was 92.9% at beginning, compared to 96.9% after the mNursing was implemented. Patients agreed that they felt the new system could be safer compared to the old practice. So far, there is no adverse event happening.

(4) **Nurse's perceived values** of the mNursing were measured with a TAMM (Technology Acceptance Model for Mobile Service) questionnaire. The results at the beginning and after the mNursing was implemented were shown in Figure 9. We could see the improved perceived values from nurses on the mNursing system.

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Figure 9. The radar chart of nurses’ perceived values of six indicators of mNursing: Usefulness, Ease to use, Ease to learn, Acceptance, Satisfaction and Trust. The results show that nurses well recognized the value of mNursing.
Nomination Letter

To those who concern,

It is my pleasure to nominate Jessie Kuo’s team as a candidate for this wonderful award to recognize provider’s contribution in leading innovative applications using informatics.

Cathay General Hospital, one of private teaching medical center in Taipei, Taiwan, started to build their nursing information system in 2008. Jessie was pointed to lead this effort at the time when she knew nothing about nursing informatics. She came to my NI workshop and this was time we started our friendship. She learned quite fast and has the talent to see the potentials of informatics in future nursing and started to fully commit herself in this new professional.

She invited me as a consultant at her hospital NIS committee and prepared herself to enter my program formal education and training. The program at my university was the best in Taiwan and very competitive. But she successfully passed the entrance exam.

I was her mentor and closely observed and was amazed how she worked with her NIS team at her hospital and made things moving so smoothly. She really knew how to work with people from various disciplines and lead a multiprofessional team to achieve a goal which nobody believed she could make it. Today, the NIS in Cathay has become one of successful NIS models in Taiwan. Jessie has become the Chief Nursing Informatics leader in her hospital and plays a very important role in her hospital HIS team.

During her school years, she had been very interested in mobile technology. Her thesis was to develop a mobile support and service system for serving the mothers with new born babies at her hospital. She did a great job and graduated with honor. She has paid a very close attention to the trends and opportunities of mobile technology. In 2010, I worked with a private company to design and manufacture the first 6” handheld Pad for nurses. She started to think about how to introduce this device in her hospital. In 2012, we came out a new Pad with a barcode reader and she immediately grasped the opportunity and started a project in building a new Chemotherapy Medication Administration. In 2013, she again led the team to success to accomplish this project.
When I heard this Pi2 award at the AMIA2013, I knew this could be the great opportunity to recognize her achievements in innovatively using informatics to support nursing care, assuring patient safety but at the same time release nurses’ burden. Therefore, I sincerely and gratefully present Jessie’s case *Seamless Total Safety: Mobile Intelligent Chemotherapy Medication Administration* for your consideration for this award.

Yours,

Polun Chang, PhD
1/1/2014
The lead candidate’s CV, resume or full bio
(See Appendix I)

The name and contact information of the person nominating the
Nominator:
Polun Chang, PhD,
Professor, Institute of BioMedical Informatics,
School of Medicine,
National Yang-Ming University, Taipei, Taiwan/ROC
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Nomination supporter:
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School of Nursing and Institute of Health Informatics
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Appendix I

Ming-Chuan Jessie Kuo, RN

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Nursing Supervisor
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Education: 1986-1989 BS, Nursing, Kaohsiung Medical University, Taiwan/ROC
2008-2010 Master, Institute of BioMedical Informatics, National Yang-Ming University, Taiwan/ROC

Positions:
(1) Secretary General, 12th International Congress on Nursing Informatics
(2) Member, International Affair Committee, Taipei Nurses Association, since 2013
(3) Chair, International Affair Committee, Taiwan Nursing Informatics Association, since 2011
(4) Member, Maternal-Child Nursing Committee, Taiwan Nursing Association, since 2009
(5) Member, International Affair Committee, Taiwan Nursing Informatics Association, 2009-2011
(6) Nursing Supervisor, Cathay General Hospital, since 2006
(7) Head Nurse, Cathay General Hospital, 1996-2005
(8) Nursing Leader, Cathay General Hospital, 1992-1995
(9) Nurse, Cathay General Hospital, 1989-1991

Research Interests:
Pediatric Nursing, Mobile Health and Support Systems, Nursing Informatics, Medical Informatics

Award:
Bronze Award, Symbol of National Quality - Safety and Quality, The Institute for Biotechnology and Medicine Industry, 2013
Excellent Award, Innovation Campaign, Taipei Nurses Association, 2013
Best Student Poster, 10th International Congress on Nursing Informatics, Helsinki, Finland, 2009
Silver Award, Healthcare Quality Improvement Campaign, Taiwan Joint Commission on Hospital Accreditation, 2005
Gold Award, Healthcare Quality Improvement Campaign, Taiwan Joint Commission on Hospital Accreditation, 2004
Silver Award, Healthcare Quality Improvement Campaign, Taiwan Joint Commission on Hospital Accreditation, 2003
Bronze Award, Healthcare Quality Improvement Campaign, Taiwan Joint Commission on Hospital Accreditation, 2002
Journal Publications (*Correspondence)

"張博論、郭明娟（2013）・跌倒預防護理信息系統的設計與應用・中國護理管理，13（12），32-33。（In Chinese）


王淑珍、李亭亭、郭明娟（2013，7月）・產婦對無線射頻系統應用於親子同室之成效研究・2013年兩岸三地護理資訊學術論文發表會口頭發表・台北：振興醫院。（In Chinese）

朱家慧、郭明娟、林庭宇、陳振淵、翁淑惠（2013，7月）・整合式神經評估資訊系統之建置經驗・2013年兩岸三地護理資訊學術論文發表會壁報發表・台北：振興醫院。（In Chinese）

李秉儀、廖麗婘、*郭明娟（2012）・實證護理臨床應用：兒科病童發燒時如何處置較佳?・全聯護訊，89，14-18。（In Chinese）

李亭亭、王淑珍、郭明娟（2012）・無線射頻辨識技術應用於親子同室政策新生兒安全管理經驗・國泰護理，7（3），2-8。（In Chinese）


古雪鈴、蔡瑞芸、郭明娟、李敏雄 (2011, 8月). 運用TRM手法建構新生兒安全有效之照護環境. 台灣健康照護聯合學術研討會壁報發表. 台北：台北福華文教會館. (In Chinese)


Kuo, M. C., *Chang, P. (2010, September). How did we show the IT people what we nurses want about the System? The case of self-developed ostomy skin assessment tool with VBA.* Poster session presented at the 13th World Congress on Medical and Health Informatics (Medinfo 2010), Cape Town, South Africa.


Book


張博論、馮榮莊、盧小珏、郭明娟 (2009) ‧護理資訊學. ‧於丁寶芬主編，醫學資訊學（初版，129-144頁）‧中國，南京：東華大學出版社。 (In Chinese)