Using an informatics education strategy to resolve the dilemma of teaching transplantation in medical institutions
Multidisciplinary medical team perspectives

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Abstract

In Taiwan, the current survival rate 1 year after transplantation exceeds 80%. However, the number of organ/tissue donors per year in Taiwan is extremely low, resulting in increased mortality. This is also true in Europe and in the United States. Recently, data from the Taiwan Organ Registry and Sharing Center showed that, although fundraising for organs/tissues slightly increased, the number of donors did not exhibit a corresponding growth trend. Identifying appropriate donors and the provision of good quality transplantation care by medical team members are current challenges. Hence, the application of information technology to in-service education for organ transplantation professionals has been suggested.

This was a qualitative study that employed qualitative content analysis with purposive and snowball sampling. The study participants (n=8, mean age 39.88±3.06 years) included medical staff involved in tissue/organ transplantation from 4 leading medical centers and 3 regional teaching hospitals, and those who participated in the informatics education system.

The interviewees from multidisciplinary medical teams showed the status of and dilemma in organ fundraising/donation/ transplantation, noting 6 core themes. Regarding relevant education and training, 4 core themes were identified.

Current educational courses for organ fundraising/donation/transplantation are inadequate and seem to provide insufficient information to multidisciplinary medical teams. Hence, it is necessary to develop a theoretical construct to create a complete curriculum framework and to establish complete fit-in professional and ethical organ transplantation learning programs based on informatics technology to increase the interdisciplinary exchange of experience.

Abbreviations: ICU = intensive care unit, TCH = Teng Cheng General Hospital.

Keywords: ethical learning programs, multidiscipline e-learning programs, organ transplantation

1. Introduction

Because of the surgical techniques, type of care, and continuous application of the concept of care, the survival rate 1 year after heart, liver, and kidney transplantation in Taiwan has exceeded

80%. Moreover, transplantation has become a significant treatment option for patients with organ failure (Table 1).[1] From 2006 to 2010, 1678 patients received kidney transplants in Taiwan. The survival rates at various stages after surgery were compared (Table 2) and it was noted that the patient's quality of life improved when they no longer underwent dialysis after transplantation.[2]

With the development of organ transplantation medicine and holistic care networks and despite the latent stress of physical and mental health, as well as, the risk of surgical complications, living tissue/organ donors feel a sense of self-fulfillment, and satisfaction. Studies have shown that if the recipient is a family member, organ fundraising/donation is perceived as an inherent responsibility. A review of the literature on organ transplantation indicated that people are willing to donate their organs for their loved ones 79% of the time, and if organs are donated to their children, donors are willing to assume the additional risk of the overall transplant process.[3]

The development of living grafts results in improved survival rates and quality of life among recipients compared with cadaveric tissue/organ transplantation.[3,4] However, the number of people awaiting tissue/organ transplants continues to increase worldwide. Moreover, there are problems with organ pairing and the number of suitable cadaveric tissues/organs is inadequate. Thus, organ transplant medicine for living grafts has been developed.[2,3,5] Considering failed cases, the Taiwan Ministry of Health and Welfare set up the Organ Registry and Sharing Center in 2002 under the Regulations on Human Organ

Organ transplant survival rate in Taiwan (2003–2014).

Category	Subjects	Median age, y	Survival rate, %			
			3 months	12 months	36 months	60 months
Heart	913	50	87	79	69	62
Kidney	3380	45	98	96	93	89
Liver	4114	53	92	86	78	74
Lung	93	45	69	57	43	30
Total	8500	50				

Table 2

The survival rate post kidney transplant in Taiwan (2006–2010).

Category	3 Months		12 Months		36 Months	
	Patient, %	Organ, %	Patient, %	Organ, %	Patient, %	Organ, %
Living	99.1	97.4	97.8	95.6	97.1	93.2
Cadaveric	98.2	91.9	96.2	88.6%	93.7%	83.1

Transplantation for donors, recipients, organ-seeking hospitals, and organ transplant hospitals to establish a link and a "fair organ allocation mechanism" and to increase "the domestic organ donation rate."[6]

To improve the effectiveness of organ fundraising/donation, the Organ Registry and Sharing Center investigated the outcomes of organ transplantation across Taiwan over the recent years (Table 3).[2] The results showed that the organ fundraising/donation performance increased slightly between 2013 and 2017; however, the donation rate remained generally unstable and the number of donors did not show a steady increase. The center also provides donation transplant seminars for information and certification, and offers online courses and quizzes to medical personnel. However, the online courses only have essay readings with post-tests; no professional, complete, and systematic course structure, and no interactive mechanisms and effective evaluations are included. Hence, improvement in this part of the education advocacy is needed.

Based on the information published by the Taiwan Organ Registry and Sharing Center in October 2017, 9094 transplant cases were reported in Taiwan; however, only 7.5% (685) of the recipients of cadaveric tissue/organ transplant were admitted. This indicates that the medical team must have all the relevant standards and training in organ transplantation to explore all opportunities for organ donation/transplantation. The reasons for the large disparity between the supply and demand of organs includes the strict conditions of organ pairing, lack of complete

and proficient resources, and the following 4 important factors: social, religious/cultural, policy, and insurance systems.[2,4,7–10] These factors not only affect society's cognition of organ transplantation but also cause a serious imbalance between the supply and demand of tissues/organs. Consequently, ethical and security controversies and conflicts, such as those related to overseas transplantations, organ trading, and the commercialization of organ transplantation, have been reported.

Patients and families may feel uncertain and anxious during the process of organ fundraising and transplant decision-making. Hence, some families hesitate to make decisions and would prefer the medical team's statements on what the best choice is, or even let the medical team directly make a decision.[4] For the patient/family in need of tissue/organ transplantation, healthcare personnel play a crucial and complex role in the overall process.[4,11]

In the case of cadaveric donors, families often have to face the sudden loss of needs. At this moment, the only criteria for determining deaths are the cessation of heartbeats. Although, legally, brain death is considered as biomedical death, there is still controversy surrounding this notion.[12] In 2017, Taiwan's legislation allowed cadaveric organ donation if the heartbeat stops; however, different medical treatments strategies exist in practice. Therefore, assessing tissue/organ functions is an indispensable step before actual tissue/organ removal. Nonetheless, different treatment strategies often result in potential conflicts between medical teams, and the status of an individual's

Table 3

Statistics of Taiwan's organizational enforcement (2004–2016).

Region	Total number of organs donated/year									Migration median age, y
	2004–2008	2009	2010	2011	2012	2013	2014	2015	2016	
North	434 (87/year)	124	123	124	93	109	123	148	169	50.9
Middle	119 (24/year)	31	31	31	43	40	34	29	39	50
South	168 (34/year)	43	46	60	51	46	60	66	64	49.8
East	65 (13/year)	17	9	14	6	7	6	21	18	–
Total	786 (157/year)	215	209	229	193	202	223	264	290	50.2

This table is from the Taiwan Organ Registry and Sharing Center (2004–2016), showing the number of cadaveric organ donation statistics.

death has always been more than mere personal matters. Moreover, in the face of different "beliefs" according to different religions, different families have different needs.

In countries that have not yet recognized or promoted tissue/organ transplantation, health workers play a key role in identifying appropriate donors, advising tissue/organ appropriate checks, and indicating the success of tissue/organ donation and implementation. Hence, a considerable relationship between the individual being solicited and the care team exists, and a complete understanding of tissue/organ donation through complete educational training is vital for the successful promotion of tissue/organ donation.[5]

According to the American Nurses Association, nursing information is "to integrate Nursing Science, Science of Technology, and Informatics Science to manage job-related materials, messages, and knowledge and to support patients, nurses, and other medical staff through the decision making."[13] Informatics technology is not only important for clinical assistance but also for education, and several studies have confirmed that informatics education is more flexible and more effective than classroom learning as learners could, according to their own level and work situation, schedule their own class hours and class time. In addition, informatics education could solve problems through multiple learning solutions and enables organizations to provide not only immediate learning goals but also learning and working skills to keep employees competitive by providing a distance-, cost-effective, and cohesive virtual learning environment.[14–16]

The informatics education system has also been suggested as an effective platform for lifelong learning.[17,18] In today's nursing and clinical education, informatics education is crucial. However, first-line medical staff often require shifts, which is coupled with manpower shortage; thus, they are often unable to meet the demands for continuing education. The clinical setting reflects a limitation on informatics education. Many people sign up for informatics education due to continuing education integrals, which are required for the renewal of licenses in Taiwan every 6 years. Thus, the learners often conduct their activities even after the courses have started. Hence, some medical institutions ask their members not to read informatics course materials during work. Some courses are designed without automatic turnover and some are designed requiring cumulative reading hours; thus, if medical staff do not reach a certain number of reading hours, they will not be recognized as having completed the course.[18–20]

Tissue/organ transplantation in Taiwan adheres to international professional standards. However, due to a serious imbalance in the supply and demand for tissues/organs, numerous controversial issues have been reported, such as overseas transplantations and the sale of organs. Therefore, establishing a correct understanding of tissue/organ transplantation and enhancing an interdisciplinary teamwork to provide complete and appropriate continuing education is imperative for medical professionals. The application of informatics technology is an inevitable mode of education and is pertinent to the provision of learning direction.

1.1. Theory and literature

Learning fuels human development and progress. With the development of social and industrial patterns and the development and progress of science and technology, individual learning or even organizational learning exists at every stage of life in different places and fields. Effective adult learning is related to the learner's life stage development and the individual's experience also affects the next state of individual learning. The key to promoting spontaneous learning in adults is often associated with different life stages and development tasks. Therefore, an individual's learning is not only from external information but also from other sources and may be self-directed. Individuals combine their past with their present learning activities, which shows continuity and interactivity. Moreover, they are willing to assume responsibility for their own learning and are capable of planning their own learning progress and process.[21,22]

The Technology Acceptance Model is a behavioral conceptual model of rational behavior that is aimed at accepting new information systems.[21] It is a suitable model for adult learning; for interpreting informatics technology among users who accept the new information system behavior and for analyzing the effects on various users, that is, those who accept and those who do not.[23,24] As suggested by DeLone and McLean,[25] it is challenging to build a series of informatics education courses or an "Information Systems Success Model" to maintain the learning relationship between learners and information systems. The quality of service is closely related to the degree of satisfaction with the service, and the degree of satisfaction is defined by the gap between the expectation and the actual perceived service. Therefore, in the internet environment, system builders could use this model to measure the characteristics of the information system.[25,26]

Further, informatics education is not only about training and guidance; it is an individual learning process and everyone still needs some technical foundation and knowledge base. Informatics education is the bridge between learning and working. Learners may combine what they have learned from their work to enhance their work efficiency because informatics education not only shortens learning and the distance to work but also reduces the gap between work and family. Informatics education is therefore an important option for continuing education. It applies to all types of work environments, particularly in the medical field, which requires a constant and timely delivery of related knowledge and education, and a training platform to enable workers to easily obtain the necessary knowledge for use in the workplace.[14–16,27]

The Script theory, which is derived from cognitive psychology, is a theory that explains how people understand how the real world influences their repeated experiences and events. It has, therefore, a goal-directed knowledge structure by which people can effectively perform their tasks.[28] Since its publication, it has been widely researched and applied. The Script theory could help one understand their own actions and could be used to achieve satisfactory results for staff training.[29–32] The establishment of a script could provide a theoretical framework to explain how organ donation/transplantation and expertise can be created and could help identify key issues and priorities in problem-solving. A script should be created by experienced and well-trained experts and scholars that have knowledge of clinical practice, time, and patient/family structure. With the help of informatics education and contextual interaction, scriptable experiences could help medical personnel become more effective in their practice.[29–31]

2. Methods

The research framework is shown in Figure 1 and the set research questions and interview outline are shown in Table 4. This study used a qualitative design with purposive and snowball sampling. The study participants were medical staff involved in tissue/organ
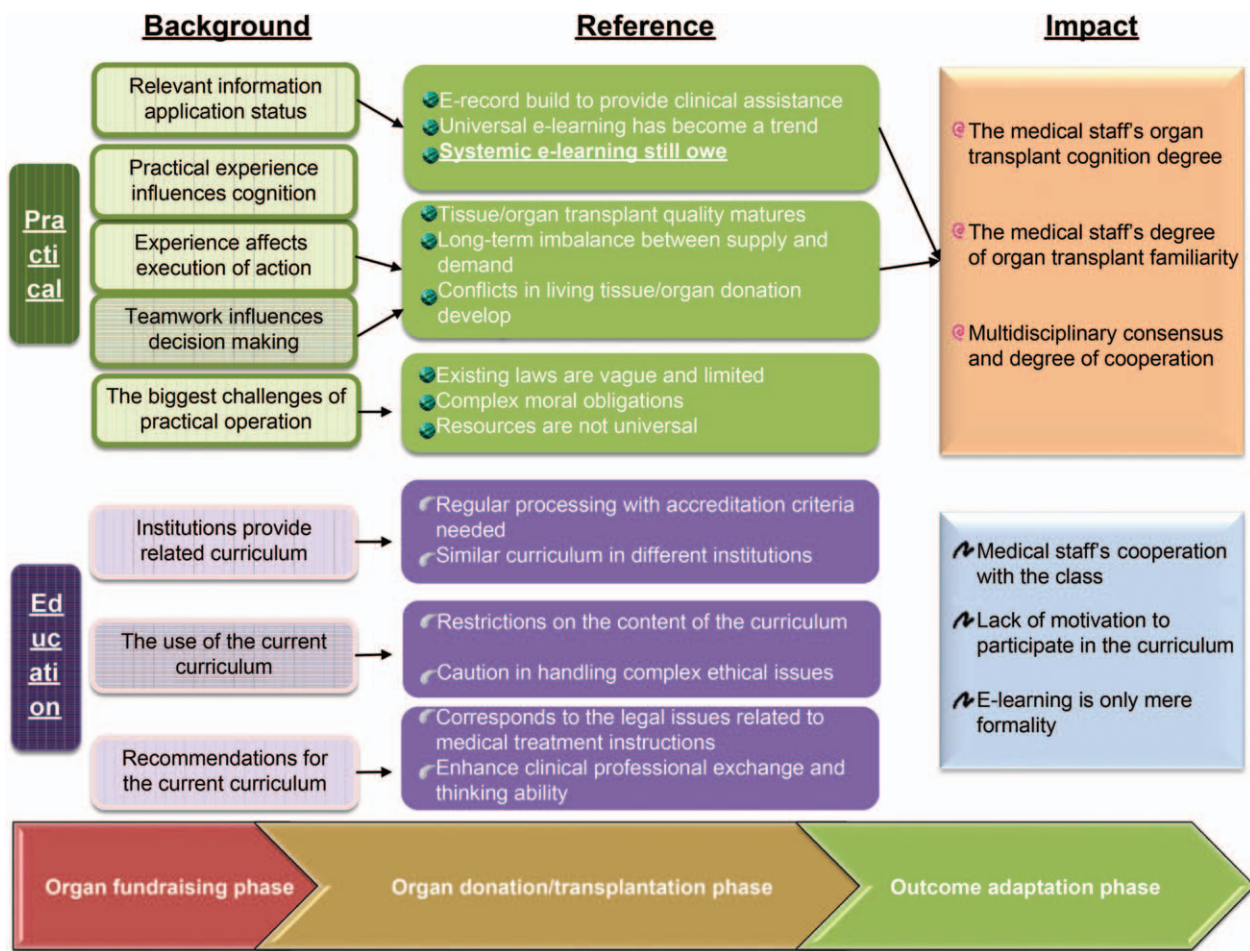
Figure 1. Schematic of the research framework.

transplant from 4 leading medical centers and 3 regional teaching hospitals, one of them is also the director of the OT society and those who participated in designing the informatics education system. The purposive sample of multidisciplinary medical staff included physicians (intensive care unit [ICU], heart-transplant expert, director of society) and registered nurses (ICU, coordinator, nurse practitioner, supervisor, transplant issue expert). After the researcher explained the purpose and the

method of research, the interviewees agreed to provide valuable experience and suggestions for the study. Face to face, in-depth interviews were conducted using a semi-structured interview outline. The study was approved by Teng Cheng General Hospital (TCH) Institutional Review Board (TCH IRB 105-B-06–01) and written informed consent was obtained. The results of the interview were analyzed and we employed a qualitative content analysis of the transcript after confirmation by the

Table 4

Research questions and interview outline.

Research question	Interview outline
1. What is the current status of using informatics technology in the field of organ transplantation?	1. Do you know the current status of the use of informatics technology in the field of organ transplantation?
2. What is the opinion of Taiwan's organ transplant team members on the plight of organ transplantation?	2. What do you think are the major issues in the decision-making process?
	3. What are the main difficulties you encountered in implementing the business?
	4. Have you ever tried solving such difficulties?
3. To discuss the perspectives between Taiwan's organ transplant team and administrative/informatics team on the use of informatics technology for breaking the dilemma of organ transplantation and determine the expected courses	5. Do you know how the current status of the donation is related to courses?
	6. What do you think are the benefits from the current donation-related courses?
4. To explore the perspectives on using informatics technology to resolve the dilemma of organ fundraising and determine the expected curricula?	7. In your opinion, what kind of education and training would be more suitable to your current job?
	8. What do you think needs to be done with the current series of education and training related to donation?

Table 5

Demographic list.

No.	Gender	Age, y	Education	Marital status	Religion	Position	Working years
A1	M	35	Bachelor	Married	None	Commissioner	10
N1	F	35	Bachelor	Single	Taoism	NP	10
N2	F	41	College	Single	Christian	SV	18
D1	M	45	Bachelor	Married	Christian	Director	20
M1	M	37	Master	Single	Taoism	Pharmacist	12
A2	F	40	Bachelor	Single	Taoism	Social worker	20
I1	M	48	Master	Single	None	Director	28
D2	M	38	Doctor	Married	None	Director	20
I2	M	55	Doctor	Married	Christian	Associate Professor	30
N3	F	41	Master	Married	Buddhism	Nurse	21
D3	M	43	Doctor*	Married	Taoism	Director of Society	22
I3	M	45	Master	Single	None	Manager	24
N4	F	39	Master	Married	Taoism	Coordinator	18
N5	F	37	Doctor*	Married	None	Nurse	5

There were 5 nurses (nurse, coordinator, NP, SV, expert), 3 doctors (Director of ICU, Director of Heart Transplant Team, Director of Society), 2 administrators, 1 pharmacist, and 3 informatics experts.
NP = nurse practitioner, SV = supervisor.

interviewees. We used the methods stated by Appleton (1995), Graneheim and Lundman (2004), Lincoln and Guba (1985). The degree of certainty, applicability, reliability, and confirmation proposed by Mauk (2009) are considerations of rigor. Descriptive statistics were used for demographic data with Excel for Windows 10 to code and SAS 9.4 to analyze the data.

3. Results

3.1. Demographic analysis

Eight interviews were conducted during the study period (2016–2017; Table 5). The participants comprised 5 women (62.5%) and 3 men (37.5%) aged 35 to 45 (39.88 ± 3.06) years. Of the 8 interviewees, 2 were unmarried (25.0%) and 6 were married (75.0%). Two had a doctorate degree (25.0%), 3 had a master's degree (37.5%), 2 had a bachelor's degree (25.0%), and 1 was still in college (12.5%). The following are the details on religious beliefs: 1 was Buddhist (12.5%), 3 were Taoist (37.5%), 2 were Christians (25.0%), and 2 had no religious beliefs (25.0%). Three were physicians (37.5%) and 5 were nurses (62.5%), including a supervisor, nurse practitioner, a coordinator, and 2 nursing experts. Years of funding ranged from 5 to 30 (16.8 ± 5.63) years (Table 6).

3.1.1. Medical team's perspectives and expectations on organ fundraising/donation/transplantation education courses.

To understand the shortcomings of current organ fundraising/donation/transplantation education courses and to clarify the need for and the idea of organ transplant courses, we interviewed a multidisciplinary team of medical professionals and identified 10 core themes. Overall, the interviewees presented the status and dilemmas of medical teams in conducting organ fundraising/donation/transplantation, which was reflected in 6 core themes. The difficulties of and proposals for education and training are reflected in 4 core themes as follows:

(1) Informatics technology used in organ fundraising/donation/transplantation All interviewees (n = 8, 100%) indicated that the hospitals had a list of consultations for hospice care, signed "do not resuscitate" forms, or downloaded forms related to the donation process. Moreover, 6 interviewees (75.0%) also noted that were currently unaware of a set of interdisciplinary and integrated donation education courses.

(2) Practical experience influences the perception of issues related to organ fundraising/donation/transplantation. The practical experience of medical professionals is not necessarily effective for establishing awareness on issues

Table 6

Demographic analysis (N = 14).

Variable	Category	Sample (N)	Percentage (%)	Mean ± SD
Gender	Female	6	42.9	
	Male	8	57.1	
Age, y	31–35	2	14.3	
	36–40	5	35.7	
	41–45	5	35.7	41.36 ± 5.33
	46–50	1	7.1	
	51–55	1	7.1	
Education	College	1	7.1	
	Bachelor	4	28.6	
	Master	5	35.7	
	Doctor (in school)	2	14.3	
	Doctor	1	7.1	
Marital	Single	6	42.9	
	Married	8	57.	
Religious	None	5	35.7	
	Beliefs	9	64.3	
	Buddhism	1	7.1	
	Taoism	5	35.7	
	Christian	3	21.4	
Position	Physician	3	21.4	
	Nurse	5	35.7	
	Nurse practitioner	1	7.14	
	Coordinator	1	7.14	
	Supervisor	1	7.14	
	Expert	2	14.2	
	Administrator	3	21.4	
	Quality control Commissioner	1	7.14	
	Social worker	1	7.14	
	Pharmacist	1	7.14	
	Informatics expert	3	21.4	
	Medical information	2	14.2	
	Informatic educator	1	7.14	
Working years	≦ 5–10	3	21.4	
	11–20	6	42.9	18.43 ± 6.80
	21–30	5	35.7	

related to organ fundraising/donation/transplantation. Five interviewees (62.5%) indicated that although there is a legislation that protects the organ transplantation team, ethically, ensuring that the family members understand the need is still the first step. Handling legal issues is the greatest challenge among individuals and teams. Therefore, relevant education and training have a notable effect on individuals and the overall outcomes.

(3) Factors that influence practice-specific actions related to organ fundraising/donation/transplantation. Four interviewees (50.0%) stated that, although they agreed with the concept of organ donation, a specific action could be affected by practical experience. Positive experiences help to promote a positive identity and practical action, whereas negative experiences, apart from causing a negative perception of organ fundraising/donation/transplantation, directly reduce the willingness of individuals to act, which in turn could affect others.

(4) The key to decision-making in organ fundraising/donation/transplantation decision. The interviewees separately outlined the key points in the empirical decision-making process of organ fundraising/donation/transplantation. Seven (87.5%) interviewees considered the process of organ fundraising/donation/transplantation and team maturity as key to making a sound decision. Ethical values, beliefs, legal, and medical differences in relation to a patient's condition were also considered essential issues for adequate team discussion. Immediate and transparent communication is crucial especially for living donations. In addition, for smaller hospitals, the basic concept of organ fundraising/donation/transplantation and the network of business execution support are not enough to ensure the accuracy and appropriateness of judgment and disposal of potential cases.

(5) The team faces the most important difficulties. Seven interviewees (87.5%) who had participated in organ fundraising/donation/transplantation proposed that the team's maturity is currently the most significant difficulty, followed by challenges in personal values.

(6) Overcoming difficulties. Five interviewees (62.5%) indicated that professional teamwork is a personal choice. Regardless of professional teamwork or cooperation, various conflicts or difficulties exist. To overcome these, an internal system or consensus must be established, which could be achieved through education and training.

(7) Course status. All interviewees (n = 8, 100%) reported that organ fundraising/donation/transplantation has been promoted for several years. Accredited hospitals provide relevant information and education. Training methods include face-to-face lessons and memorial activities, and the subjects could be divided into 2 categories: administrative/volunteer and medical professional. However, 50.0% (n = 4) of the interviewees responded that the current courses only provided learners with a basic understanding of the topics and desired that the hospital set-up a dedicated department to provide advice, especially for unfamiliar situations.

(8) Personal benefit of the courses. Several methodologies that could help establish the awareness of organ fundraising/donation/transplantation exist. Seven interviewees (87.5%) agreed that the curriculum affected the establishment of personal awareness. In the medical professionals' perspective, some preoperative and postoperative care knowledge is considered the most rewarding part. For the interviewees, it

seemed essential to understand the questions related to donor care, the conducting of in-depth explanation and communication, and the need for spiritual support. Moreover, one interviewee considered that relevant education satisfaction surveys could accurately reflect whether personal benefits of the courses exist. Four interviewees (50%) also suggested that, because of the formal restrictions on the current curriculum, the proportion of intentions and priorities in medical care are not enough, and that staff members feel that their level of knowledge is equivalent to those of other staff members who take the same course.

(9) Comparison of course forms Interviewees unanimously responded that in the hospital, courses on related topics were regularly provided for accreditation purposes, which in turn influenced them and the team's perception of organ fundraising/donation/transplantation. For the design of the curriculum, the Taiwan Registry and Sharing Center was divided into fundraising and transplantation care, which are provided on demand as per the hospitals' request. Even in other hospitals, the differences are not obvious but they mainly depend on the degree of specialization of the subjects and the intervention in the organ transplantation stages. However, personal experiences of empathy, family background, and beliefs affect the decision-making process, with attitude to donation being the most important factor. Thus, handling each individual case depends on the accumulation of experience and patient status. Three nurse interviewees (60.0%) indicated that for the members of non-affiliated units, the relevant courses are non-required credits and the same or a similar curriculum increases the motivation to participate.

(10) Suggestions for improvement. Four interviewees (50%) suggested that the explanation of legal issues should be improved and 4 interviewees (50%) suggested the strengthening of professionalism. For the method of education, 6 interviewees (75%) supported the idea that informatics education should be tailored towards the characteristics of the curriculum and learners' needs. For the running time of the course, only 3 interviewees (37.5%) supported that the length of each course should be 15 to 20 minutes.

4. Discussion and conclusion

According to the interviewees, the process of organ fundraising/donation/transplantation and team maturity was key to making a sound decision. They noted that regardless of professional teamwork or cooperation, various conflicts or difficulties existed. To overcome these, they suggested the establishment of an internal system or consensus, which could be achieved through education and training. The interviewees also noted that the current courses only provided learners with a basic understanding of the topics and suggested the setting up of a dedicated department to provide advice, especially for rare situations. These opinions indicate the need for a set of interdisciplinary and integrated courses on organ donation based on an informatics education framework.

4.1. Related education website

Numerous instructional websites in Europe, the United States, Canada, and Asia exist. Most of the related themed courses are illustrated by videos or are shared as practical examples, such as pathophysiology or anatomy, and 3-dimensional videos are used

as an additional tool to help learners easily understand the course content. For advocacy and family support-related topics, perceptions are elaborated or shared to help learners recognize actual thoughts, feelings, and reactions of the patient/family member. However, the pattern of open participation through a fully interactive informatics curriculum was not observed in the websites that were visited.

The current web course design has the following advantages: less memory space requirements, simpler editing or replacement, and ease of operation. However, the pattern of fragmentation into auxiliary teaching is different from the concept of complete informatics education; hence, a comparison of the support and benefits of learning effectiveness is difficult. Considering patients/ families, all professions are modeled independently and each professional has his/her own experiences and beliefs. The inadequate knowledge pooling of relevant professions results in the inability of learners to ultimately acquire organ fundraising/donation/transplantation care expertise that is integrated across team consensus.

4.2. Importance of the research finding

In the first phase of this study, 6 core themes regarding the opinions on the use of informatics technology for transplantation and 4 thematic sections for the education curriculum were identified. An analysis of the findings showed that even if hospitals conduct relevant education and training courses or promote the concept of the related policy, medical professionals in non-affiliated business units are still unfamiliar with the process of organ fundraising/donation/transplantation. This, in turn, demonstrates the importance of applying an illness script for course designs in the future. Moreover, acquiring basic knowledge and concepts through participation in learning courses is crucial. This point also echoed the literature indicating that patients, their families, or even medical personnel may be less helpful at a critical time because of a lack of knowledge about organ transplantation, misconceptions, or a lack of training and skills.

However, the existing related education and training courses are limited; thus, the topics that can be included and the depth of teaching are also relatively limited. Consequently, integral certification and designing an interactive informatics education series (eg, 15–20 mins for a single class model) are necessary to provide the needed courses on organ fundraising/donation/ transplantation. Moreover, based on literature, informatics education is not only the trend but is also in line with adult learning, multidisciplinary learning characteristics, and the current state of the medical environment.

This study further compares and analyzes the perspectives of different medical professionals and attempts to achieve a complete understanding of the application of interdisciplinary informatics technology to study and for the care of patients who undergo organ transplantations. In this study, we hypothesized that an integrated and interdisciplinary training course would provide improved clinical benefit. As such, we emphasized that a breakthrough strategy should be based on the combination of information technology and the Script theory, which could resolve the dilemma of teaching transplantation in medical institutions. Based on the situation and the dilemmas concerning the present state of education about organ transplantation, a way to address the limitation with respect to public insurance system restrictions due to hospital cost is appropriate educational program design and participation. This study also suggested that goals be set in stages and that a quality mixed research design be employed. Further development of the theoretical construct, the establishment of a set of informatics education courses for organ transplantation that meets professional and ethical needs and increasing the breadth of multidisciplinary exchange of experience are important.

Author contributions

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