Infection Prevention and Control (IPC) Program in Hospital

by Safira Anis Rahmawati

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Keywords	Abstract
	Healthcare Associated Infections (HAIs) or nosocomial infections are still the most common problems in health services. Hospitals need to implement infection prevention and control (IPC) as a standard for the quality of hospital services and to protect patients, health workers and visitors from unexpected infections. In fact, the implementation of infection prevention and control programs in various hospitals had not been well implemented. This article analyzed the factors affecting the implementation of infection prevention and control programs in hospitals. This article used a literature review method using 30 articles from various data sources such as Google Scholar, NCBI (National Center for Biotechnology Information), AHRQ (Agency for Healthcare Research and Quality), ScienceDirect, and PSNet (Patient Safety Network). The literature used were articles published during the last ten years, according to the specified inclusion criteria. The results of this article review indicated that the factors affecting the implementation of infection prevention and control programs in hospitals were the management function, the role and function of the room's leader, the availability of facilities and infrastructure, and organizational culture factors.

Introduction

Healthcare Associated Infections (HAIs) or nosocomial infections are undesirable effects in health services whose risk of its incidence is still increasing. This infection is the most common complication in hospitalized patients and became the fourth cause of death in hospitals. HAIs are infections that occur in patients during the treatment process in hospitals or other health facilities that are not incubated at the admission. According to the Centers for Disease Control and Prevention, the types of HAIs that can occur in hospitals are divided into Central Line-associated Bloodstream Infections (CLABSI), Catheter-associated Urinary Tract Infections (CAUTI), Surgical Site Infections (SSI), and Ventilators-associated Pneumonia (VAP) (1).

Hundreds of millions of patients worldwide became infected with HAIS each year, causing significant death and financial loss to the health system. A survey was conducted in 183 hospitals in the United States with 11,282 patients reporting that 4% of patients were infected with at least one type of HAIS (2). In high-income countries, about 30% of patients in the ICU were infected with at least one type of HAIS. Whereas in low and middle-income countries, the frequency of infections acquired in the ICU was at least 2-3 times higher than in high-income countries (3). In Asian countries, the incidence of nosocomial infections occurred as much as 10%, while in America the incidence of nosocomial infections occurred in ± 5% of the 40 million patients treated each year with the mortality rate reached 1% and the burden of handling costs reached 4.5 billion dollars per year. The prevalence of HAIS infection in patients in developed countries varied between 3.5% and 12%, while in developing countries including Indonesia, the prevalence of HAIS infection was 9.1% with a variation of 6.1% -16%. According to data from the Ministry of Health, HAIS infections in Indonesia reached 15.74%, far above developed countries, which range from 4-8-15.5% (4).

Several studies have indicated that HAIs cause more extended hospital stays, increasing morbidity, increasing antimicrobial resistance, increasing treatment costs, and even led to increased

morbidity and mortality. This would also have an impact on the use of hospital resources more than usual. The hospital's efforts to prevent and control infection are one of the indicators to assess the quality of hospital services. The incidence of HAIs in the hospital could result in the quality of service become not optimal so that appropriate action is needed to prevent and reduce the incidence of these infections. In principle, the incidence of HAIs can be prevented if health care facilities consistently implement Infection Prevention and Control (IPC) programs.

The Infection Prevention and Control (IPC) program in a hospital is one of the quality standards for hospital services, moreover implementing optimal infection prevention will also increase the level of patient safety. The Infection Prevention and Control (IPC) program are activities that include planning, implementation, coaching, education and training, as well as monitoring and evaluation processes. These efforts are not only carried out by health workers at the hospital, but required cooperation between the hospital, patients, and other health service facilities to prevent patients, health workers, and visitors from unexpected infections.

The implementation of the Infection Prevention and Control (IPC) programs in several hospitals were still not running optimally. A study conducted at the Ibnu Sina Padang Islamic Hospital showed that the implementation of the IPC Program had not been optimal and there was a discrepancy with the Regulation of Health Minister Number 27/2017 about Guidelines for Infection Prevention and Control in Health Service Facilities. One of the problems often found was the problem of recording and reporting HAIS, which was not optimal (5). A study conducted in RSUD Dr. Iskak Tulungagung stated that the achievement rate for recording and reporting nosocomial infections was only 15.38%, this rate was very low compared to the national standard which reached ≥ 80% (6).

Implementing Infection Prevention and Control programs in hospitals requires commitment and supportive resources. Many parties are involved in its implementation, so the success of infection prevention and control programs in hospitals affected by many factors. However, there were still many hospitals that do not pay attention to these factors so that the implementation of infection prevention and control programs in hospitals had not been running optimally. The purpose of this study was to identify the factors affecting the implementation of infection prevention and control programs in hospitals. This article review was expected to help the corrective actions of infection prevention and control problems in hospitals.

Methods

This study was conducted using the literature review method. In the literature searching process, the authors used several databases including Google Scholar, NCBI (National Center for Biotechnology Information), AHRQ (Agency for Healthcare Research and Quality), Science Direct, and PSNet (Patient Safety Network). Keywords entered were the keys relevant to the topics, namely "Infection Prevention and Control Program", "Infection Prevention and Control", "Factor Influencing Infection Prevention and Control", and "Factor Associated with Infection Control". The inclusion criteria in this literature study were 1) the article had the scope of research on infection prevention and control, 2) the article was published, 3) the article was available in full text. Based on the various literature findings, the authors selected 30 published articles that were considered relevant to the topics to be concluded in the literature review. The published articles used consisted of 8 review articles and 22 research articles published during the last ten years (2010-2020). The factors found were then grouped and analyzed in a narrative form.

Results

One of the goals of patient safety was to reduce the risk of infection related to health services. Infection Prevention and Control (IPC) was one of the standards in the implementation of hospital management. The purpose of organizing the IPC program was to improve the quality of health care facilities, reduce the incidence of HAIS, and to identify and reduce the risk of infections acquired and transmitted among patients, staff, health professionals, contract workers, volunteers, students, and visitors (7). Based on the various literature used, it was known that various factors affecting the implementation of infection control programs in hospitals. The various factors were then grouped into several main factors, namely the education and training of the IPC team factor, the management function factor, the role and function of room's leader factor, the availability of facilities and infrastructure factor, and the organizational culture factor.

Tabel 1. Research Publication

References	Location	Methods	Factors Influencing
Hutahean and Handayani, 2018	X Hospital, Jakarta	Interview, observation, and questionnaire	1. Function and role of room's leader
Lelonowati et al., 2015	Dr. Iskak Hospital, Tulungagung	Interview and FGD	1. Education and training 2. Management support 3. Monitoring and coordination function
Sapardi et al., 2018	Ibnusina Hospital, Padang	Interview	1. Facilities and infrastructures 2. Human resources (education and training)
Kartika et al., 2014	Paru Batu Hospital	Observation and interview	1. Management support and commitment 2. Human resources development
Hapsari et al., 2018	Haji Hospital, Surabaya	Questionnaire	1. Education and training programs
Fitria et al., 2016	Dr. Radjiman Wediodiningrat Hospital, Lawang	Pretest dan post-test	1. Facilities and infrastructure
Alemania et al., 2018	Dr. M. Djamil Hospital, Padang	Interview, questionnaire, and document review	1. Manager role
Herman and Handayani, 2016	Government hospital data from Medical Facility Research	Descriptive analysis	1. Facilities and infrastructure
Hutahean et al., 2018	Two Hospitals in Jakarta	Quasi experiment	1. Role of room's leader
Masloman et al., 2015	DR. Sam Ratulangi Hospital, Tondano	Interview and observation	1. Hand hygiene 2. PPE 3. Patient equipment processing and linen management 4. Waste management
Wahyuni et al., 2020	Padang Panjang Hospital	Cross-sectional quantitative	1. Hand hygiene 2. PPE 3. Waste management
Heriyati et al., 2020	Majene Hospital	Survey	1. Knowledge
Nurlinda and Jannah, 2018	dr. Zainoel Abidin Hospital, Aceh	Correlation study	1. Directional function of room's leader
Satiti et al., 2017	RAA Soewondo Hospital, Pati	Interview and document review	1. Hand hygiene 2. Waste management 3. PPE
Adhiwijaya et al., 2017	Labuang Baji Hospital, Makassar	In-depth interview	1. Facilities and infrastructures 2. Healthworkers awareness 3. Cases recording
Ramayanti et al., 2019	Pasaman Barat Hospital	Interview, observation, and FGD	1. Policy 2. Guideline 3. Methods 4. Human resources 5. Funding 6. Facilities and infrastructures 7. Monitoring 8. Surveillance 9. Education and training

Tabel 1. Research Publication (cont)

References	Location	Methods	Factors Influencing
Madjid and Wibowo, 2017	Tebet Hospital, Jakarta	Observation and interview	1. Policy 2. Facilities and infrastructure 3. Supervision role
Gilbert and Kerridge, 2019			1. Leadership and Role Modelling
Borg et al., 2015		Survey	1. Organizational culture
Esfandiari et al., 2016	24 Hospitals in Iran	Interview	1. Governance and stewardships 2. Resources 3. Safety culture 4. Monitoring and surveillance systems
Triantafillou et al., 2020	3 Hospitals in Athens	In-depth interview	1. Resources 2. Knowledge 3. Culture 4. Policy
Mugomeri, 2018	16 Hospitals in Lesotho	Interview	1. Effective IPC governance and leadership 2. Training 3. Facilities

Tabel 2. Review Publication

References	Methods	Factors Influencing
Zingg et al., 2015	Systematic review	1. Staff training 2. Microbiological support 3. Data management support
Castro-Sánchez and Holmes, 2015	Article review	1. Policies and guidelines 2. Performance monitoring and indicators 3. Team composition 4. Leadership and leaders 5. Involving patients 6. Communication, social media, and technology
Bono et al., 2014	Literature review	1. Organizational culture
Lee et al., 2019	Systematic review	1. Education and monitoring 2. Surveillance 3. Multi-model strategies 4. Environment materials and equipment
Zocher et al., 2019	Systematic review	1. Training and education
Russo et al., 2018	Systematic review	1. Electronic HAIS surveillance software
Peter et al., 2018	Systematic review	1. Knowledge and training
Knobloch et al., 2019	Scoping review	1. Leadership (teamwork, managerial oversight, climate and culture, staffing support, and administrative support)

Discussion

Education and Training of IPC Team Factor

Human resources were the most important resource in implementing the program in the hospital, including in implementing the IPC program. This was because human resources were considered capable of solving something and became a resource that can control other resources (8). One of the roots causes of low performance of the IPC team was the lack of socialization of the program to the IPC team through education and training, and even knowledge of infection prevention and control was considered to be an obstacle for health workers in implementing IPC (6,9–11). Education and training is an effort to develop human resources, especially for increasing professionalism related to administrative skills and management skills (leadership).

The task of the entire IPC team required special abilities and skills that can be obtained through education and training programs organized by the IPC committee and management. This was in accordance with the Regulation of Health Minister Number 27/2017 about Guidelines for Infection Prevention and Control in Health Service Facilities that in implementing IPC, health service facilities must conduct IPC education and training. Infection education and training programs are one of the alternative solutions in increasing the competence of health workers regarding infection. Based on research conducted at RSI Ibnu Sina, it stated that increasing human resources that could be done to prevent and control infection in hospitals was by implementing training and in-house training (5). The study conducted in RSUD Dr. Iskak Tulungagung revealed that there was a significant relationship between the provision of training programs and the increase in knowledge, attitudes and skills of officers (6). The same thing was also stated in other study which showed that there was a correlation between knowledge and the performance of infection prevention and control in hospitals (12).

One of the requirements or criteria for the IPC team was attended IPC training and basic education (13). However, in reality, there were still many hospitals that have not provided IPC training and basic education to health workers in hospitals, especially the IPC team. The form of IPC education and training consists of IPC communication, information and education, as well as training. The IPC education and training program must be carried out continuously, not only during the initial formation of teams and committees but also carried out regularly. The training which carried out optimally will help to improve the performance of human resources as well as reduce unwanted costs and losses due to infections caused by health workers in hospitals.

After the provision of education and training program, it is also necessary to take sustainable action from the training in the form of continuous monitoring and supervision of the leadership so that the results of the training can be implemented optimally. Leaders can also provide rewards or punishments for health workers who implement the results of training in the implementation of infection prevention and control. Moreover, participants who take part in education and training can educate, socialize, and teach the material to other health workers.

Management Function Factor
(1) Planning

Hospital IPC programs required good planning activities. Planning includes the process of setting goals and establishing implementation guidelines, policies, procedures, and alternative programs. Hospitals need to establish infection prevention and control activities, including standard precautions which accordant with the Regulation of Health Minister Number 27/2017 about Guidelines for Infection Prevention and Control in Health Care Facilities.

Program planning can be done based on the results of the evaluation of the previous period's activities as well as the follow-up based on the results of the audit that has been carried out. Planning that needs to be done is not only related to the formation of policies, guidelines but also includes planning related to the allocation of funds for development and knowledge of human resources program as well as the provision of facilities and infrastructure that can support the IPC program. (14). Hospitals also need to determine indicators of success for each program to be implemented, so that the success rate of implementing IPC activities can be measured in the hospital.

Based on research conducted at Paru Batu Hospital, one of the three priority problems in the implementation of infection prevention and control in the hospital was the absence of guidelines for implementing infection prevention and control as well as effective socialization to all staff (4). Policies and guidelines have a vital role in improving the quality of services, such as in infection prevention and control. Even though policies and guidelines have been established, commitment from all parties is needed to implement these policies and guidelines as good as possible.

(2) Organizing

In the implementation of IPC in hospitals, it is necessary to establish an infection prevention and control organization (IPC Committee) to achieve the vision, mission and objectives that have been set. The IPC committee that formed must be able to carry out duties, authorities and responsibilities effectively and efficiently. One of the factors that cause the implementation of the IPC program to be not optimal was that health workers do not understand the work carried out by the IPC team due to the lack of clarity of tasks and functions of implementing IPC (15). Also, the double burden of health workers was an obstacle to the effectiveness of the implementation of the IPC program in the hospital, therefore a clear organizing is needed. This organizing includes the division of tasks, responsibilities and authorities related to infection prevention and control activities.

Parties involved in infection prevention and control efforts were the IPC team consisting of IPCD (Infection Prevention and Control Doctor), IPCN (Infection Prevention and Control Nurse), and IPCLN (Infection Prevention and Control Link Nurse) (13). All parties involved were arranged in an organizational structure which was then legalized through a Decree (SK). However, there were still many hospitals that do not have an organizational structure that was accordant with the Regulation of Health

Minister Number 27/2017 about Guidelines for Infection Prevention and Control in Health Care Facilities. The hospital should make a Decree (SK) regarding the IPC organization and make a written organizational structure so that the tasks and responsibilities can be implemented optimally. Besides, there should be an explanation of tasks and functions, responsibilities, and also authorities of each position which clear and accordant with the guidelines for infection control and prevention in health care facilities.

(3) Actuating

The implementation included the process of delegation, supervision, coordination, direction, and controlling the implementation of organizational plan (15). The focus in this stage was guiding and increasing the motivation of all parties involved in IPC activities to carry out all infection prevention and control activities optimally. Efforts that can be done are giving rewards and punishment, providing feedbacks, integrating organizational's goals with individuals, reducing job dissatisfaction, facilitating a supportive environment for healthcare workers and supporting resources.

(4) Controlling/Monitoring

Controlling was one of the important component in the implementation of IPC program in hospital and the task of IPC committee (16). Monitoring was carried out by comparing activities that occur with predetermined standard, deciding and measuring gaps that occur, and taking necessary corrective actions. Monitoring in a program was done to ensure that the implementation of planned activities can be conducted properly and can reach the determined goals. Monitoring was done not to find mistakes, but to increase the performance of team members. This was in line with a study that stated the more often IPCLN received effective monitoring from superiors, the more its performance increased (6).

The implementation of monitoring must be supportive and educational, not authoritarian. Monitoring is done objectively, not only to monitor whether health workers do their duties according to procedures but also to improve the process of implementing the IPC which is carried out if there is a discrepancy. Monitoring can be done either directly or indirectly. Direct monitoring is carried out by doing activities present in the field and also controlling to the treatment room. Meanwhile, indirect monitoring can be done through coordination between IPC teams with the head of the hospital committee. Based on Regulation of Health Minister Number 27/2017, monitoring was done not only for patients but also for the patients' family and guests in the form of warnings given by officials regarding the rules that must be obeyed. This was accordant with the objectives of infection prevention and control program which are to increase the quality of services in health care facilities to protect human health resource, patients, and the community from infectious diseases related to health care.

Apart from monitoring, it is also necessary to evaluate, record, and report on IPC activities. Recording and reporting was one of the essential factors in implementing the IPC because it could assist the program with the evaluation process, however, recording the incidence of infection were sometimes not recorded in the recording form (15). Recording can be carried out through the sheet collecting data recorded by each nurse who handles patients and will be reported to the team IPC and the head of the hospital committee periodically. The head of the hospital committee needs to give feedback regarding the reporting of infection incidents that have been implemented.

Role and Function of Room's Leader

The role of a leader greatly determines the success of an organization in achieving predetermined goals. In carrying out their role as front-line manager, room's leader in hospital played a role as the manager for the IPC program. Several studies have shown that the implementation of role and function of room's leader greatly affected infection prevention and control, especially in the nurse's compliance of implementing IPC efforts (17–20). The absence or inferior role of the room's leader could lead to poor performance in the implementation of the IPC program. Moreover, study showed that the performance of IPC in hospitals was not carried out according to standards (8,21). The room's leader encourages the nurses to direct them towards achieving the goal (22). A powerful encouragement will produce good behaviour in the form of directed activities towards predetermined goals.

(1) Interpersonal Roles

One of the significant relationship between the role of room's leader with the implementation of IPC in hospital is the role of interpersonal. There were three leadership roles comprise fundamental interpersonal relation, such as the role as a figurehead, the role as a leader and the role of a liaison manager. Room's leader should have a leadership role to do various tasks and as a liaison in the implementation of IPC (23). Meanwhile, the role of a room's leader as a figurehead or leader can be seen when they motivate, inspire, and give examples through their roles regarding the implementation of IPC.

(2) Informational Roles

Information in the implementation of IPC is truly needed to minimize the transmission of infection. The informational role of the room's leader includes monitoring, disseminator, and the role of spokesperson (18). The informational role of the room's leader is to gather any pieces of information related to IPC in the

ward. The information obtained is filtered and evaluated to take action regarding IPC. Also, the room's leader plays a role as a channel of communication, both between nurses and with parties outside the ward related to the implementation of IPC.

(3) Decisional Roles

Decisional roles includes interpreneurship, management of disruptions, resource allocator, and a negotiator. The room's leader must be able to make a choice or a decision in implementing the IPC. In addition, a room's leader must be able to move as an initiator and to design changes to improve organizational performance. One example of a role as a resource allocator is the proper distribution of human resources in all IPC activities. The room's leader should know the capabilities of the members and provide the opportunity for its members to improve capabilities through programs of education and training (18).

Availability of Facilities and Infrastructures

Every health care facilities should provide enough resources to support the implementation of infection prevention and control. The hospital's leader should develop team committee of infection prevention and control and also provide sufficient resources in the effective implementation of infection prevention and control. Facilities and infrastructure was one of the most important resources to undertaken (5,15). The implementation of the IPC program must be balanced with the provision of facilities and infrastructure that meet the requirements so that the program's implementation can run optimally. This was in line with several studies which stated that limited facilities and infrastructure was one of the factors that influence the inadequate implementation of IPC in hospitals (24–26). However, hospital management often paid less attention to this matter because the provision of these facilities and infrastructure requires a large amount of money, so that budget limitations constrained it.

The result of the study carried out at RSI Dr Radjiman Wediodiningrat Lawang showed that three significant factors became obstacles for reporting information of prevention and control. One of them was the lack of facilities (27). This was because supporting facilities for infection control programs in rooms were still challenging to obtain. This was accordant with the theory presented by Green (1980) that the availability of facilities was one of the factors that influence compliance and included an enabling factor in implementing a program. The lack of universal precaution application in hospitals might occur due to the unavailability of facilities to ensure health in hospital and personal environment.

One of the supporting facilities and infrastructure for the implementation of IPC is personal protective equipment (28,29). Every hospitals' healthcare workers must use personal protective equipment based on the activities that need to be done. This needs to be done to minimize the incidence of infection in the hospital. Although personal protective equipment can not eliminate the risk of infection, it is crucial to use it effectively and efficiently. It must always be used at all times when it comes in contact with the patient's blood, body fluids, as well as the patient's excretions ad secretions. In its implementation, it requires continuous availability of personal protective equipment and training for the use of such personal protective equipment. All healthcare workers also should be aware that the use of personal protective equipment does not replace the need to follow necessary infection control measures such as hand hygiene.

Several examples of personal protective equipment forms are handscoens, protective glasses, masks, aprons and gowns, protective shoes, cap/hair covers, and so on. Handscoen needs to be used when it comes in contact with blood, bodily fluids, body secretions, or other contaminated materials. At the same time, masks are used to prevent and protect the nose and mouth when in contact with blood or bodily fluids. Personal protective equipment that must be prepared is used by health workers who provide direct care to patients and work in situations that require contact with patients' bodily fluids, all healthcare workers who may be in contact with the patients' bodily fluids or blood, or the patients' family in the hospital.

One of the primary keys to infection prevention and control activities in the hospital was the hand hygiene program. Based on several studies, it was shown that increasing hand hygiene adherence in hospitals also increasing the success of prevention and control programs in hospital (28–30). The implementation of the program required adequate supporting facilities and infrastructure, such as hand rub and sink. Apart from hand hygiene, hygiene, security, easy access, heating, air conditioning, ventilation, and water management also played an essential role in protecting healthcare workers and patients.

Facilities and infrastructure that were no less important to support the implementation of prevention and control in hospitals were the Management Information System and the provision of special software especially for infection surveillance (31,32). Both of those things are much needed in the implementation of recording and reporting of infections so that all incidents of infection in the hospital can be recorded and reported in a systematic and integrated manner. The hospital web-based Management Information System can support existing performance and needs and is used for IPC data processing so that the hospital management system services are more advanced. However, there were still many hospitals

that had not used this system and still carried out manual recording and reporting of infection data, so they did not support the coordination and accuracy of infection data.

Organizational Culture Factor

Healthcare is a very comprehensive system. Organizational culture played a vital role in achieving every goal in health services because organizational culture can foster or change attitude and behaviour in health service (9). An influential organizational culture in the health care institute requires compliance with existing rules and procedures in the organization. Organizations that promote a shared organizational culture with teamwork, leadership, adaptability, and mutual support could develop more effective IPC programs. The effectiveness of the implementation of infection prevention and control was very dependent on the successful interaction of several management systems which were also heavily influenced by organizational culture. Several studies have shown that there was a relationship between organizational culture and performance (33). Nurses' behaviour in implementing the IPC program will be influenced by the characteristics of the hospital, such as the vision, mission, goals, leadership style, and organizational culture. Culture can have a meaningful influence on the behaviour of members in the organization because a person's daily life cannot be separated from their environment.

The organizational culture approach could be used to increase individual commitment so that if individuals have a high fidelity, the implementation of the planned program will be easier to carry out properly. One of the organizational cultures that dramatically influence the implementation of the IPC program in the hospital was the culture of patient safety (34). Patient safety culture plays an essential role in achieving every goal in health care. For example, the culture of washing hands will effectively reduce the incidence of infection in the hospital. Efforts to achieve this culture require support from all parties in the hospital, starting from the leadership, health workers, and patients. If there is no comprehensive support from these various parties, it can become an obstacle in implementing the IPC program. Another component of organizational culture that must also be considered is the culture of effective communication. The absence of a culture of communication between health care organizations, healthcare workers, patients and nurses can influence awareness about the risk of infection in the hospital. Besides, without effective communication, it will be challenging to determine an effective strategy to improve the performance of IPC.

A good organizational culture could occur because of the support from the organizational leadership. Strong leadership was essential to the implementation of organizational culture in the hospital. A recent study of the relationship between organizational culture and organizational culture behaviour identified that hospitals with more effective leadership exhibited better hand hygiene adherence (33). Hospitals that have an excellent organizational culture are also less likely to encounter obstacles in implementing IPC.

Conclusions

Based on the literature used by authors, it can be concluded that the implementation of infection prevention and control in hospitals might be influenced by several factors, which were education and training of IPC team factor, management functions factor, role and functions of the room's leader factor, the availability of facilities and infrastructure factor, as well as organizational culture factor.

Recommendations given to hospitals are to increase effectiveness and efficiency by paying attention to the factors that affect the implementation of infection prevention and control programs. In addition, hospitals also need to conduct audits and evaluate the implementation of infection prevention and control programs regularly. Audit and evaluation activities are carried out to measure and assess the success of infection prevention and control program at hospital.

Acknowledgments

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PAGE 2

PAGE 3

PAGE 4

PAGE 5

PAGE 6

PAGE 7

PAGE 8

PAGE 9

PAGE 10