The advantages of NCP Electronic in nutrition care documentation at Saiful Anwar Hospital Malang, Indonesia

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ABSTRACT

Objectives: Quality of nutrition care can be accomplished by Nutrition Care Process (NCP) and International Dietetics and Nutrition Terminology (IDNT). Lack of access to resources to support easy-to-use documentation is one of the obstacles using NCP and IDNT. Information technology can be used as a tool to record nutrition care and overcome the obstacles of using NCP and IDNT. Health information technology studies often focus on information technology design and implementation without considers end user’s acceptance. Perceived advantage is one of perceived that influences user’s acceptance of information technology. Nutrition Care Process (NCP) Electronic is an application based on computer which is developed to document NCP easily. This application’s trial was conducted in Saiful Anwar Hospital Malang where it has already used NCP easily. This study aimed to investigate dietitian’s perceived advantages of NCP Electronic

Methods: This was a qualitative study in which the design was an exploration case study. The number of informants was 8 dietitians. The data were collected through in-depth interviews and observations.

Results: The dietitians considered that NCP Electronic has some advantages. The advantages were grouped by three aspects. There were data processing and documentation nutrition care, nutrition care document storage and dietitians’ job performance. The first advantage of using NCP Electronic was easier and faster to record nutrition care. Secondly, in document storage’s aspect, nutrition care could be recorded automatically because it could be saved in a storage device so that it would minimize the data loss. In job performance’s aspect, NCP Electronic could reduce the dietitians’ workload. They would not be tired to write, and also in terms of performance, dietitians felt using NCP Electronic improved dietitian’s image.

Conclusion: NCP Electronic was more advantageous for dietitians than nutrition care manual documentation. The advantages were easiness and swiftness in processing the data and documenting nutrition care, nutrition care automatic record, reducing dietitians’ workload, in terms of performance dietitian felt using NCP Electronic improved dietitian’s image.
INTRODUCTION

Quality of nutrition care requires a standardized process to reduce process variation. Nutrition Care Process (NCP) was developed by the Academy of Nutrition and Dietetics as a standard of nutrition care process so that nutrition care can be done through consistent processes (1). Nutrition Care Process is designed to support evidence-based practices consists of four steps that are related to each other. The four steps are nutrition assessment, nutrition diagnosis, nutrition intervention, and nutrition monitoring and evaluation (2). Each step of NCP described by the International Dietetics and Nutrition Terminology (IDNT). International Dietetics and Nutrition Terminology is a standard language/terms created to make uniform terms among dietitians (3). Some countries have adopted NCP and IDNT. NCP and IDNT already begin to be adopted in United States, Canada, the Netherlands, England, Japan, Korea, Hungary, Israel, Sweden, and Turkey. It proves that NCP and IDNT can be applied internationally (4). Adoption of NCP and IDNT in Indonesia conducted by the Ministry of Health through the Hospital Nutrition Services Manual in 2013. Hospital Nutrition Services Manual had instructions about standardized nutrition care process which adopt NCP along with IDNT. This guide is intended as a reference to improve nutrition care in hospitals. The Ministry of Health expected hospitals in Indonesia to provide nutrition care by adopting the systematic method of NCP and IDNT (5). There were several obstacles in the implementation of NCP and IDNT by dietitians. A study about workload analysis and performance of dietitians performing NCP at Hasan Sadikin Hospital in Bandung. The study showed that a high workload in conducting NCP produce lower quality work. Factors contributing to this were a long time NCP documentation and a lack of capability of dietitians to understand the importance of documenting NCP (6). Dietitians found it difficult and required a longer time using NCP and IDNT (7). This may be caused by a lack of resources that support the ease of nutrition care documentation. Generally, IDNT guidelines are predominantly paper-based and dietitians may prefer the hardcopy manual if they using paper-based record (8). Information technology is expected to help overcome the obstacles of implementing NCP and IDNT. Nutrition information and technology can provide electronic-based nutrition care documentation. Health care using electronic allows the use of IDNT standard, supports the ease of implementing NCP and provides nutrition care documentation storage. In a study comparing paper and electronic-based documentation showed that nutrition care using electronic-based documentation 13 minutes faster than paper-based documentation (9). Health information technology (IT)
research often focused on IT design and implementation without considering how end-users react about the acceptance of IT (10). Innovation Diffusion Theory (IDT) is a theory used to describe the user’s acceptance. This theory consists of variables or perceptions affecting IT innovation to be accepted (11). One of the important perception affecting acceptance is the perceived advantage of health IT innovation. The advantage of health IT innovation is considered by health professionals (12). There is a tendency of a health professional will be more accepting of health IT innovation that provides many benefits for them (13). One study that evaluated the acceptance of nutrition IT was a pilot study carried out in Australia. In this study, the researcher developed a prototype combining NCP and IDNT on the online documentation system. These results indicated that the developed prototype could be well accepted by dietitians for its perceived of advantages that might help dietitians (8). Nutrition Care Process (NCP) Electronic was a computer-based application that was developed to assist in processing data and documenting NCP easily, quickly and accurately. The existences of applications like NCP Electronic will not be useful for dietitians when only be created without evaluated the user’s acceptance. NCP Electronics’ trial was conducted in Saiful Anwar Hospital Malang where it has already used NCP so that the dietitians accustomed to do the nutrition care using NCP. This study was aimed to investigate the advantage of NCP Electronic based on dietitian’s perceptions at Saiful Anwar Hospital Malang.

METHODS
This was a qualitative study in which the design was an exploration case study conducted in November 2015 until March 2016 at the internal medicine ward of Saiful Anwar Hospital Malang. The number of informants was 8 dietitians who in charge of dietitians in internal medicine wards, received NCP Electronic training, abled to operate computer/laptop, minimum education was nutrition diploma, willing to participate in this study.

The theme’s examined in this study was the perception of the advantages of NCP Electronic. Perception of NCP Electronic advantages was defined as responses from dietitians about the advantages of NCP before and after the trial. NCP Electronic tested in this study was a computer-based application created with Visual Basic 6 program with the Basic programming language. NCP Electronic was a Windows-based and semi-automatic application which some parts required dietitians’ decisions. It was a personal user application which it was used by each user (dietitian) and not integrated among users. The application could be developed further and its contents could be easily changed, added or subtracted.

The main features of NCP Electronic shown in Figure 1 is the nutrition care documentation system following four steps of Nutrition Care Process (NCP); Nutrition Assessment, Nutrition Diagnosis, Nutrition Intervention,
Nutrition Monitoring and Evaluation. Besides the main features, there are tools including the calculation of special conditions, the calculation of nutritional status, menu analysis, dictionary of food and drug interaction, IDNT Electric, guideline of intervention that included the calculation of energy, macronutrients and fluid’s requirement. In this calculation tools, there was source option of calculation formula, the stress factors and activity factors. The application also provides some automation. There was the automation of the calculation of anthropometric and nutritional requirements, automation of analyzing and interpreting laboratory results and clinical examination, automation of displaying diet standard’s options along with the standard diet’s energy composition and macronutrients commonly used in Saiful Anwar Hospital Malang.

Figure 1. Screen shot of NCP Electronic Layout

Before NCP Electronics’ trial was conducted, dietitians were trained about its parts as well as how to use NCP Electronic. Every dietitian was given a module and their laptops were installed with NCP Electronic application. NCP Electronics’ trial was conducted by documenting nutrition care for patients with DM (Diabetes Mellitus), cancer, CKD (Chronic Kidney Disease), heart disease, and CVA (Cardiovascular Accident). NCP Electronics’ trial was conducted after dietitians documented all nutrition care cases of the patients in the medical record as their daily activities.

The data were collected through in-depth interviews and observations. In this study, there were triangulations. Triangulation of time was conducted so that in-depth interviews and observations were done twice. The first in-
depth interview conducted before the trial. The second in-depth interview conducted after the dietitians tried to use NCP Electronic documenting several cases of patients.

Observations of process and documents were performed in this study. Observations of process were performed twice; when dietitians documenting cases of patients as usual in medical records and also when dietitians documenting cases of patients with NCP Electronic. Observations of the document were conducted to observe the document of nutrition care in medical records and document of nutrition care results input from NCP Electronic. Observations were used as a method for triangulation.

The researchers in this study roled as interviewer and observer. Researchers used the interview guide contained open questions that have been tested previously on other dietitians had similar characteristics to the informants of this study. The data analysis was done by transcribing verbatim in-depth interview results and coding. Code or label used to describe the results of research in narrative and to compare with theory or other research according to the research theme. This study has received ethical clearance from the Medical and Health Research Ethics Committee (MHREC) Faculty of Medicine Gadjah Mada University with number KE/FK/1013/EC/2015. The dietitians have agreed to be an informant of this research by signing the inform consents.

RESULTS
CHARACTERISTICS OF INFORMANT
Table 1 showed that the study involved eight dietitians who match with the inclusion criteria of the research as key informants. Eight dietitians of internal medicine wards recorded 40 documents cases of patients with DM type 2 and 30 documents cases of patients with other diseases (heart diseases, chronic kidney disease, cancer, and cardiovascular accident) either manually in medical records or electronically with NCP Electronic.

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>n (8)</th>
<th>%</th>
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<tbody>
<tr>
<td>age (year)</td>
<td></td>
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</tr>
<tr>
<td>&lt; 30 year</td>
<td>7</td>
<td>87.5</td>
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<tr>
<td>&gt; 30 year</td>
<td>1</td>
<td>12.5</td>
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<tr>
<td>Gender</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>2</td>
<td>25</td>
</tr>
<tr>
<td>Female</td>
<td>6</td>
<td>75</td>
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<tr>
<td>Working time in Saiful Anwar Hospital</td>
<td></td>
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<tr>
<td>&lt; 1 year</td>
<td>1</td>
<td>12.5</td>
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<tr>
<td>&gt; 1 year</td>
<td>7</td>
<td>87.5</td>
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</tbody>
</table>
NCP Training
Yes 8 100

Final education
Nutrition Diploma 3 37.5
Nutrition Bachelor 5 62.5

Computer Ability
Ms.Office and Windows 8 100

ADVANTAGES OF NCP ELECTRONIC

The result of the study obtained three sub-themes of perception of NCP Electronic’s advantages. The advantages were grouped by three aspects. There were advantages of NCP Electronic in aspects of data processing and nutrition care documentation, in aspects of nutrition care document, in aspects of job performances. In aspect of data processing and nutrition care documentation in this study referred to the perceived advantages of dietitians in the process of working on and record the nutrition care start from classifying and sorting the data that would be used, analyzing the data by comparing the data with certain indicators, and interpreting the results of data processing, determining the priority issues to be appointed as nutrition diagnosis until the process of determining nutrition intervention and the planning of nutrition monitoring evaluation. The advantages in aspect of nutrition care documents in this study referred to the benefits of NCP Electronic to save the nutrition care process data. The advantages in aspect of job performances in this study referred to the benefits of NCP Electronic to help the dietitians on their work and also referred to the impressions of a dietitian about himself after using NCP Electronic.

NCP ELECTRONIC’S ADVANTAGES ON DATA PROCESSING AND NUTRITION CARE DOCUMENTATION ASPECTS

The dietitians felt the same advantages of NCP Electronic before and after the trial (can be seen in Table 2). However, there were some advantages mentioned on in-depth interviews before trial but no longer mentioned in in-depth interview after trial. Some of NCP Electronic’s advantages mentioned both in in-depth interview before and after trial were: (1) ease to do the calculation, to analyze the data recall, and the availability of nutrition diagnosis; (2) shorten the time of calculating and documenting nutrition care. The calculation was more accurate and NCP Electronic could accommodate more references were two advantages only mentioned in in-depth interview before the trial.
Table 2. Code of Dietitians’ Statement about Advantage Perception on Processing Data and Nutrition Care Documentation Aspects

<table>
<thead>
<tr>
<th>Before The Trial</th>
<th>After The Trial</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Ease to do:</td>
<td>1. Faster (calculation, documentation of nutrition care)</td>
</tr>
<tr>
<td>• Calculation, (Formulas and calculation factors are available, automatic results)</td>
<td>• Calculation (automatic, simply enter basic data, no need to open the book, just choose the formula)</td>
</tr>
<tr>
<td>• Recall (data analysis)</td>
<td>• Determination of Recall (calculate the intake of patients)</td>
</tr>
<tr>
<td>• Availability of nutritional diagnosis (can see the full type, just select)</td>
<td>• Available Nutrition Diagnosis (already obtained Nutrition Problem)</td>
</tr>
<tr>
<td>2. Shorten the time documenting care nutrition</td>
<td></td>
</tr>
<tr>
<td>3. The calculation is more accurate (provided the calculation formula)</td>
<td></td>
</tr>
<tr>
<td>4. Accommodate more references (references formula)</td>
<td></td>
</tr>
</tbody>
</table>

The important benefits perceived by dietitians were NCP Electronic could help to shorten the time of nutrition care documentation and calculations. Initially, only a few dietitians who claimed these advantages in in-depth interviews before the trial. After the trial, the advantages associated with this time felt by all the dietitians. One dietitian claimed that the trial was a step in proving that what was stated by a dietitian as an advantage of NCP Electronic, which was faster in in-depth interviews before the trial was felt by the dietitian during the NCP Electronic’s trial. After using NCP Electronic several times, dietitians felt faster in the calculation because by simply entering some data, calculation results could be immediately known. Besides, using NCP Electronic could be faster because of its guidelines that should be adapted to the needs, while manually took longer because of the large folder of medical records that must be filled:

"Yes it may be faster for the calculation because we just insert (the data), it is just straight out how much the energy requirement, if the manual we should calculate it manually, like that.” (Interview After Trial, Dietitian 1)

"... for example in electronics seems to be faster because there are guidelines we just have to try to put the data on the application (NCP Electronic) and for the manual mm.. for the manual it takes a long time because we should charge the medical records has a lot of folders.” (Interview After Trial, Dietitian 3)

Statements of dietitians in in-depth interviews after the trial recognized as a confirmation or verification of dietitians’ statements in in-depth interviews before the trial.

NCP ELECTRONIC’S ADVANTAGES ON NUTRITION CARE DOCUMENT ASPECTS

Nutrition Care Process (NCP) Electronic is an application that can be used to document nutrition care. Dietitians felt NCP Electronic also had advantages in nutrition care document storage aspects. According to dietitians

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using NCP Electronic, nutrition care could be documented automatically and with electronic storage systems would minimize data loss because it could also be stored on storage devices:

“... talk about advantages... it should be automated if patient (documenting patient data) electronically it is obviously documented yes. For example (documenting patient data) manually it will be lost, I mean if electronically can also be lost, the data can also be lost but what is it...? the data can be lost but minimal especially if we can save the data to the other storage devices.” (Interview Before Trial, Dietitian 8)

Based on the results of in-depth interview after the trial, nutrition care storage function also stated by other dietitians as the advantages of NCP Electronic. According to the dietitian, using NCP Electronic nutrition care data could be neater and more compact than documents in medical records that need a lot of space to be stored:

"... could help the implementation of the NCP it becomes more practical, more efficient and effective in time and place so you know. Effectively it means the medical records where the physical shape is big, thick especially when it comes to long care patients. So.. if digital files.. the storage will be more compact." (Interview After Trial, Dietitian 2)

Description of the interview above indicated that one of the advantages of NCP Electronic perceived by dietitians is the nutrition care can be documented electronically. Although nutrition care can be stored electronically using NCP Electronic, it should be noted also the nutrition care documenting form commonly used in Saiful Anwar Hospital Malang.

**NCP ELECTRONIC’S ADVANTAGES ON DIETITIANS’ JOB PERFORMANCES ASPECTS**

There were also advantages in aspects of job performance related to the performance of the dietitians. Based on the results of in-depth interviews to dietitians, there were some of the perception of the advantages in aspects of job performance, which were the workload could be reduced, the hand was not tired of writing and in terms of performance dietitian felt more modern and "cool " (self-image of the dietitian increased).

According to dietitians using this application, workload in documenting nutrition care could be reduced. A dietitian expressed earlier that the difficulties encountered in conducting nutrition care was a workload (load that many nutrition care and medical records stuffing a lot with limited time as well as patients who were few and might move the other room at any time). Dietitian stated that NCP Electronic could be beneficial to reduce the workload especially in reducing the time in manual things:

“... Yes definitely yes (perceived of advantages)... because if we are based on the difficulty is that the burden yes, what is it? .. workload ... so hope with the help of this application workload is reduced yes manual things that takes a long time will be reduced with the application of our expectations as it was.” (Interview Before Trial, Dietitian7)
Some dietitians claimed that using NCP Electronic, dietitians should not write the nutrition care manually so that their hands would not be tired. Observations supported this result. In daily activities, dietitians should write a lot in the medical record. Documenting nutrition care in medical record was done by filling out the forms that have anything to do with nutrition care as much as seven pieces, namely F2 consisting of two part: form of nutrition screening and form of initial nutrition assessment, F3 listed the nutrition problems that occur in patients, F5 contained of initial nutrition care plan, F.75a which was integrated medical record, F7.3 contained notes of patient progress and F9 was nutrition resume. According to the dietitians’ statement there were 7 new patients in average every day for every dietitian. So that dietitians should write 7 nutrition care of the new patients in a day and they also should track old patient’s intake as nutrition monitoring and evaluation.

In addition to the above two benefits, one dietitian believed using Electronic NCP, the work became more modern and in terms of performance, his image would be improved for using electronic devices. During this time dietitian felt too manual in performing the calculations, using the NCP Electronics dietitian felt more modern using electronic devices. The same dietitian consistently expressed the same benefits both in interviews before or after the trial:

"... This application hopes ee .. what is it? yes we will have our work much more modern yes .. little bit  hehe .. (laughs), so that during the time we were too manual doing the calculation .. huh count with a calculator or mobile phone it e e ee .. what .. ... with this application a bit cooler if you say the terms now, cooler just a little bit .. it seems .. .. from the side of the performance feel cooler so yes .. hehe .. ( laughs ). " (Interview Before Trial, Dietitian 7)

"Yes it was possible that people now .. we hope so .. what is it .. our equipment cooler slightly, more modern.. hehe (laughs). So we have.. what .. modern device to do our job. " (Interview After Trial, Dietitian 7)

DISCUSSION

Based on the result of the study, there was three sub-themes of advantages perception of NCP Electronic. There were advantage in aspects of processing data and nutrition care documentation, advantage in aspects of nutrition care document, and also advantage in aspects of job performances. The important NCP Electronic’s advantages stated by the dietitians were NCP Electronic could help dietitians to shorten the time of the calculation and nutrition care documentation. The calculations referred to nutritional status calculations and nutrient requirement calculations. Hospital Nutrition Services Manual in 2013 stated calculations of nutritional status and nutrient requirement were components of the nutrition care process that should be done by dietitians. Assessment of nutritional status could be done comparing the body size (anthropometric) data, while the
nutrient requirement calculations determined according to nutrition diagnosis, the patients’ condition and also the type of the illness (5).

The dietitians claimed that nutrition care documented in the medical record take a long time whereas the calculations also take a long time because they have to calculate manually. This results was consistent with another study which stated that the Nutrition Care Process (NCP) documentation took a long time(6). Another study mentioned that dietitians felt calculating nutrient requirement was a time-consuming activity and in some cases, dietitians did not do the nutrient requirement calculations (14).

The dietitians in this study stated that using NCP Electronic, the calculations of nutritional status and nutrient requirement could be done faster than manually. Dietitians found there were tools in NCP Electronic that could speed up the documentation and the calculations. In the anthropometric section, there was a tool that automatically calculated and analyzed the generated results as well as the calculation of the nutritional status of the patients. In biochemical and clinical physical section there was automation in interpreting and analyzing the result of laboratory and clinical examination of the patients. In the part of nutrition diagnosis, some tools could display nutrition diagnosis and its code (IDNT). In the intervention section, NCP Electronic equipped with calculation formulas, stress factor and activity factor to calculate patients’ nutrient requirements so that dietitians did not need to open their pocketbook to find a formula calculation that took time. Automation of the calculation was also applied in this application so that, when the numerical data was entered, the tools in this application would calculate and automatically showed the results of the calculation. Moreover, intervention section contained selection automation feature of diet standards along with energy and macronutrient composition commonly used in Saiful Anwar Hospital Malang.

In line with this, research using electronic systems showed that in documenting nutrition assessment, the electronic systems 13 minutes faster than manual/paper-based system. The electronic systems were used to be faster to document the nutrition assessment for the electronic systems had automation functionality in the calculation of anthropometric and nutrient requirements. The electronic system also had nutrient requirement databases, automation of importing features from the database institution, calculation of patient’s goals achievement (9).

Dietitians also felt that using NCP Electronic nutrition care can be documented automatically and the electronic systems using NCP Electronic would minimize data loss because it could also be stored on the data storage devices. The documentation in the medical records was expected to provide services data storage delivered to patients and improve communication among health workers (15). However, each step of work depends on the
health worker’s time resources, experience, and routine with paperwork and may be susceptible to neglect and data loss if documentation cannot be carried out immediately (16). Generally, an electronic documentation systems can give benefits to store the patient’s care data, including nutrition care with NCP along with IDNT (17).

In the job performance aspect, NCP Electronic could reduce dietitian’s workload, dietitian did not feel tired of writing, no need to flip through medical records and also using NCP Electronic could improve dietitian’s image. Based on the dietitian’s statement using NCP Electronic could reduce the dietitian’s workload because it could replace some manual work of dietitians. Previously, dietitians delivered one of the difficulties encountered was the workload, which was the number of nutrition care should be done by the dietitians. Dietitians had to do the nutrition care of the patients who should be treated in a limited time. This was in line with the statement of the health workers that they were dissatisfied with large patient loads, burdened with administrative tasks, frustrated by reporting requirements, and angry about losing control of patient care decisions. Information technology is hoped to ease the task of documentation of health workers (18).

Another advantage in terms of job performances was the dietitian’s work became more modern and in terms of performances, dietitian felt his image improved as the use of electronic devices. One perception that may affect the acceptance of innovation is the perception of the image. Perception of image was the perception that describes the degree to which the use of an innovation can increase the impression of a person or his status in the social system. The perception of NCP Electronic’s advantages in this study based on advantages perception affect the acceptance of innovation by Innovation Diffusion Theory developed by Everett M. Roger. However, from the result of in-depth interview, it was found one of the advantages associated with the perception of the image which is the development form of the advantages’ perception in Innovation Diffusion Theory (19). Based on the results of the study, it can be concluded that NCP Electronic has advantages according to the dietitians’ perception. NCP Electronic could simplify and accelerate data processing and nutrition care documentation, nutrition care could be documented automatically, and using NCP Electronic dietitians’ workload could be reduced as well as in term of performances, dietitian felt his image improved by using electronic devices. This study was conducted in one part of nutrition services at the hospital so that the number of dietitians involved limited. Further research can be done on a wider section of hospital involving more dietitians so that the the results of the study can be varied and provide an overview of the advantages of NCP Electronic to the potential users, which is the dietitian. Other than that, the use of NCP Electronic in Saiful Anwar Hospital Malang had to be considered the fact that documentation of the nutrition care process was integrated with medical record.
ACKNOWLEDGEMENTS

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