Improving the Effectiveness of Interprofessional Work Teams Using EHR-based Data in the Treatment of Chronic Diseases: An Action Research Study

Hiromi Yamaguchi, Yasunobu Ito
School of Knowledge Science, Japan Advanced Institute of Science and Technology (JAIST), Ishikawa, Japan

Abstract--**The purpose of this paper is to focus on changing the consciousness of health care workers towards cooperation in the hospital hierarchy, which is a problem for achieving effective team medical care in medical institutions. Team medical care is important in order to enhance the effectiveness of medical services, and the Japanese government has been trying to incorporate team medical care into the medical system. Through the examination of a hospital's case, we tried to clarify that, with the assistance of visualization by a medical information tool, co-medical staff have the potential to become players who can express their professional opinion to doctors on their own initiative.**

I. INTRODUCTION

The purpose of this paper is to focus on changing the consciousness of health care workers towards cooperation in the hospital hierarchy, which is a problem for achieving effective team medical care in medical institutions. In particular, we reveal whether the hospital hierarchy is headed through the use of medical information tool. This case is an action research in which one of the authors was involved as part of a team engaging in efforts to introduce a new system in a medium-sized hospital in a region in Japan.

Interprofessional Work (IPW) is an important factor in enhancing the effectiveness of medical services. Doctors cannot provide health care to patients without the cooperation of a variety of co-medical experts.

However, potential difficulties are often noted in a collaboration [5] [17] [23]. One of the difficulties is the existence of the hierarchy where doctors are at the top of the medical institutions; the other is the unclear boundaries of jobs between medical practitioners.

When co-medical staff engage in their jobs, they are required to follow the "doctor's orders"; this is even in medical law [15]. For example, even if co-medical staff noticed that contraindicated drugs were prescribed to patients by a doctor, the staff may hesitate to suggest the alternative drugs to the doctor directly. In this paper, while considering the present situation, we first describe the situation. Secondly, we focus on how to change the consciousness of health care workers by using a medical information tool using EHRs data.

It is said that the introduction of the electronic clinical path and sharing information through the tool is a major factor in promoting Interprofessional Work (IPW). Medical information tools are used for data storing, processing, information, and knowledge management related health care [2], [10], [13], [20]. Although a wide variety of resistance from practitioners to the new introduction has been reported in previous researches [1], [4] [23], the introduction of electronic information technology, and disease management using EHRs data tools, was reported to have improved medical care including diabetes care [3].

A medium-sized local hospital in the Hokuriku region where the author works introduced an electronic information tool called 'Disease Management MAP (MAP)' used to calculate new medical fees. Additionally, the hospital tried to aggregate information to visualize the treatment status of the patients. In this paper we analyze the effectiveness of cooperation of medical experts using data from the EHRs.

II. STRUCTURE OF HEALTHCARE ORGANIZATIONS IN JAPAN

The central role of physicians in Japan has been clearly defined by medical laws and regulations. Regarding occupations besides physicians, their tasks are limited to certain parts of healthcare and other medical actions/practice require 'doctor's orders' to be executed. In the current situation, the government is encouraging cooperation and collaboration among medical team members in order to promote patient-centered medical care. They have noted that in order to successfully realize/implement medical team members, there is a need for 'equal footing' in practice. However, efficient implementation is difficult not only for medical staff but also for administrators in the management of medical institutions at present, because of the hospital hierarchy and the sectionalism of professionals [5] [7]. Therefore, we analyze the current situation of chronic disease treatment and aim to find a way to overcome such difficulties through using a medical information tool as an intermediary for visualizing the therapeutic situation.

Japanese medical costs have thus far been contained by the nationally uniform fee schedule, in which the overall revision rate is first set and item-by-item revisions are then made. Japan's basic policy has been to combine a tight control of the conditions of payment with a laissez-faire approach to how services are delivered; this combination has led to a scarcity of professional governance and accountability [9]. So what can be done to improve the quality of care in Japan? In view of the fact that cost constraints are not likely to disappear in the future, Hashimoto and Ikegami recommend several structural reforms to improve the quality of care. They assert that "physicians have to improve their accountability through an organizational mechanism to monitor the quality of care and to enhance peer competition over quality" [9]. To do so, team medical care by IPW is essential in practice.

Recently, the shortage of doctors and nurses has become a

serious challenge in Japan [11]. To overcome the problem, the government has adopted several measures. One measure is the promotion of electronic information technology. Another is a newly established reimbursement system to health care workers who promote interprofessional work, in this case, in the diabetic treatment management of outpatient.

Needless to say, medical fees are the main source of income for hospitals; the revision of the reimbursement of medical fees is carried out every two years in Japan. According to the outline of the revision of reimbursement of medical fees of 2012, "prioritized distribution in areas that are needed for the development of environments in which people/patients can receive safe, reliable, and high-quality medical care."[16]. The first priority is “reducing the burden of medical professionals, including hospital doctors, thereby enabling them to continue provide acute medical care, etc. in an appropriate manner” [16]. As to measures for that, the “prevention and management fee of diabetic nephropathy" (hereinafter called To-bo-kan)" was introduced to the newly established reimbursement of health care for outpatient services in 2012.

III. MEDICAL INFORMATION TOOLS AND NEW MEDICAL FEE SYSTEM

A. Diabetic nephropathy dialysis prevention management fee

The government aims to reduce medical costs for treatment, in particular bills for treatments which incur high costs, such as dialysis. Diabetic nephropathy (DN) is the root cause behind the increase in patients who need dialysis. The purpose of the introduction of the new reimbursement of medical fees is to prevent aggravating that increase, and thus help reduce health care costs. The new system is intended for outpatients either using oral antidiabetics or/and insulin or over 6.5% of HbA1c [16]. Furthermore, they must be beyond stage 2 of diabetic nephropathy without currently undergoing dialysis. These diabetic patients must be educated by three medical professionals (i.e. a doctor, nurse and dietician) on how to avoid becoming patients in need of dialysis in same day. In addition, hospitals have an obligation to report information regarding the results of said education, such as the percentage of patients who have improved conditions and the number of patients educated, to the chief of the Regional Bureau of Health and Welfare.

B. Diabetic nephropathy and Disease Management Map

Diabetic nephropathy (DN) is the leading cause of end-stage renal disease. DN is a clinical syndrome characterized by proteinuria, hypertension, and a relentless decline in Glomerular Filtration Rate (GFR). Several therapeutic approaches have been performed to reduce proteinuria and GFR in patients who have DN [18], [21]. It is important that the checking of indicators of the progression of nephropathy and measuring of urinary albumin excretion (UAE) be carried out to find patients who are still in the early stages of the disease [21].

“Disease Management Map” was developed by the Japanese NPO Disease Management and Regional Collaboration Support Center. The function of this tool is to class the stratification of severity of patients and to achieve optimized therapy. The MAP indicates HbA1c, the basis of control of diabetes; LDL, cholesterol levels, and carotid IMT, which indicates cardiovascular disease; and urinary protein or urinary albumin and eGFR, which indicates the level of severity of chronic kidney disease. It visualizes the poor therapeutic situation of patients. Fig.1 shows the scheme of Disease Management MAP.

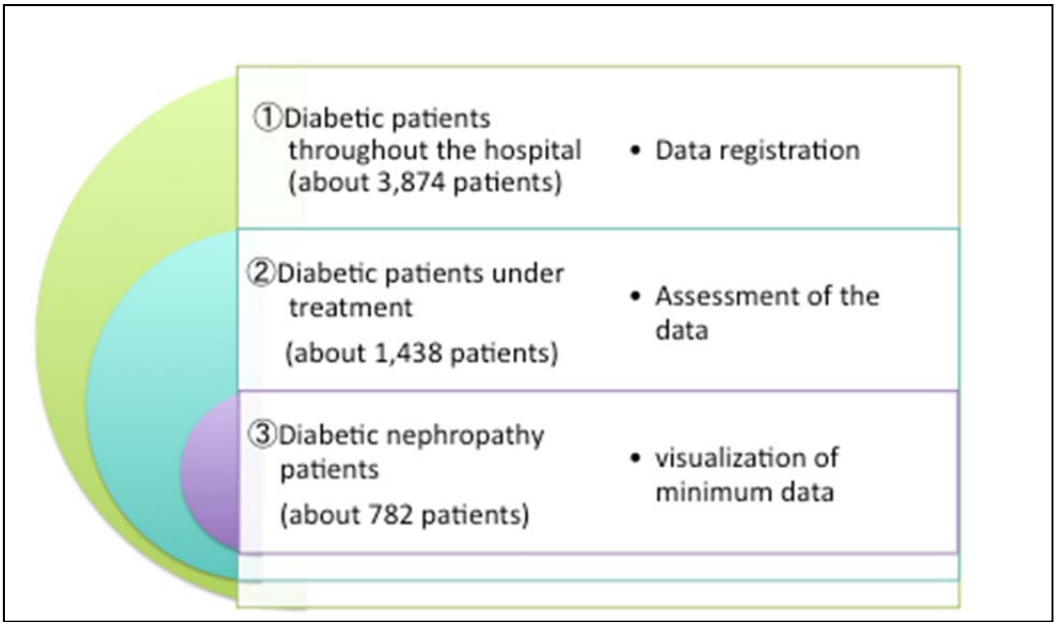

Fig1. Scheme of the Disease Management Map

Fig.2 Picture of the "Disease Management Map"

Firstly, the hospital's staff register all diabetic patients with their history of diabetes (1). Secondly, they assess the data of patients under the treatment (2), and, thirdly, they visualize the priorities of medical care for each patient (3). The current state of patients under the treatment has been visible not only to doctors but also to all other medical staff. The Fig.2 shows the picture of the MAP. The orange blank cell indicates the data of patients which need to be reported, and the pink indicates the data of patients who should be controlled by medical care.

IV. METHODOLOGY

The study was carried out in a medium-sized hospital in Hokuriku region where one of the authors works as a medical technician in the division of medical statistics. We employed anthropological/ethnographic research methods (participant observation and informal interview) to investigate the work practices of medical professionals. This study is also an action research that uses 'MAP', a medical information tool.

A. Ethnography and Action research

Anthropological ethnography is based mainly on participant observation – observation using the five senses through exposure to or involvement in the day-to-day or routine activities of participants in the research setting. In addition, the flexibility to read the situation and adjust themselves to new occurrences distinguishes anthropological/ethnographic researchers [6].

Throughout the study, one of the authors who had been trained as an anthropological ethnographer conducted structured and un-structured interviews as well as participant-observation in the hospital while working as an operator in charge of the aforementioned MAP.

Action research is described by K. Lewin as "a comparative research on the conditions and effects of various forms of social action and research leading to social action" that uses "a spiral of steps, each of which is composed of a circle of planning, action and fact-finding about the result of the action" [14], [19].

Fig.3 indicates the steps - originally devised by K. Lewin and modified by authors – taken for our action research [19].

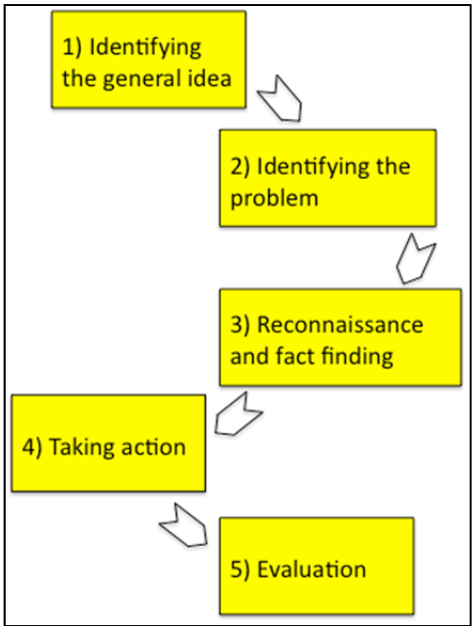

Fig.3 Scope of the Action Research [19]; modified by authors

B. The procedure of our action research

The procedure of our action research is as follows:

1) Identifying the general idea: firstly we considered the change in medical practitioners and how they think regarding the revision of the medical payment system, which assumes the existence of team medical care, i.e. doctors, nurses and other co-medicals. Hospitals cope with the new medical payment system based on governmental policy which states that all medical practitioners need to collaborate on 'equal footing' to successfully realize team medical care.
2) Identifying the problem: we identified the current problem as being in (i) the hospital hierarchy, where the doctors are on top, and (ii) the sectionalism of professionals whereas the boundary between areas where co-medical staff engage in is unclear.
3) Reconnaissance and fact finding: thus we find that the difficulties lie in the fact that even if co-medical staff discover medical oversights by doctors, they cannot point out or cope with the problems autonomously because of the hospital hierarchy.
4) Taking action: the vice-principal of the hospital introduced 'MAP,' a medical tool used for managing and visualizing the current medical care situation. To observe the effectiveness of its introduction and the results was our step of action.
5) Evaluation: the visualization by 'MAP' shed light on and unearthed the real medical situation in the hospital, including medical oversights by doctors – which co-medicals (non-doctors) were already vaguely aware of – and brought it out into the open. Even though the structure (i.e. the hospital hierarchy) remains unchanged, and even if the hospital cannot easily change the traditional structure itself, co-medical staff have the potential to become players who can express their professional opinion to doctors on their own initiative with MAP's assistance.

V. RESULT AND DISCUSSION

As we mentioned above, this research is an action research with close attention to medical context and structure in Japanese hospitals, governmental policy and the revision of the medical payment system.

We describe the results according to the steps we took, which were inspired by K. Lewin's framework mentioned previously.

A. Identifying the general idea

The number of diabetic patients who have had their condition diagnosed in Japan was about 2.4 million people in 2011. (There are 6.5 million diabetics who have either discontinued treatment or who have not yet undergone any treatment.) On the other hand, the number of diabetes specialists is as low as 4760 (2013 JDS [21]). Yet, in urban areas these specialists are unevenly distributed. It is therefore an issue that must be resolved. In the current situation where there are insufficient doctors, there are many diabetic outpatients in the hospital. Furthermore, it has become clear that there are many patients who have yet to receive examinations regarding diabetic complications.

Needless to say, doctors cannot provide health care to patients without the cooperation of a variety of co-medical experts, especially when it comes to diabetic medical care. To promote effective collaboration, the government has adopted several measures. One such measure is the promotion of electronic information technology, and another is a newly established reimbursement system which promotes interprofessional work. New regulations, such as collaborative medical guidance for patients, have become a paid (reimbursed) medical treatment. As we mentioned, diabetic patients must be educated on the same day by three medical professionals (i.e. a doctor, nurse and dietitian) on how to avoid becoming patients who need dialysis.

B. Identifying the problem

As we pointed out in previous sections, we identified the current problem as being in the hospital hierarchy – the fact of the doctors being on top – and the sectionalism of professionals.

One of the authors interviewed the medical staff about the medical team.

> *"…This is a task that should be handled by the PT (Physical Therapist), so I'll do it. But I think that is the nurse's job." "Well, it's very difficult to say that what the ideal form of the medical team should be. ... That task is usually the nurse's job, so if I do it too much then they'll think it's my job." (Physical Therapist,18 Jun. 2012)*

From the physical therapist's remarks, it was clear that staff were reluctant to overstep the boundaries of their prescribed job description. However, it was also hinted that certain tasks were ambiguous in terms of who should undertake them.

The following is an example of standard practices among nurses and nutritionists. Before they take action, they must receive instructions from physicians. One of the authors who was operating the IT system showed the list of patients requiring education to the nurse, and urged the nurse to go ahead and provide guidance to patients using their own manuals. However, she hesistantly replied:

> *"We nurses must always follow the doctor's instructions. We can't provide guidance to the patients before receiving instructions from the doctor." (Nurse, 18 Jun. 2012)*

C. Reconnaissance and fact-finding

Authors found that the difficulties lie in the fact that co-medical staff cannot autonomously point out or cope with problems or medical oversights by doctors because of the hospital hierarchy.

Pharmacists monitor the choice of drugs. They are required to advise doctors, and to alter doctors' decisions if doctors prescribe contraindicated/incompatible drugs. According to one of the pharmacists,

> *"I can't really say things directly to the doctor, so I'll send him an email instead. Even so, my emails often go ignored."*
>
> *"I guess doctors have their own reasons for prescribing the drug, but I sometimes worry about their decisions because of pharmaceutical incompatibilities." (Pharmacist, 13 Jan. 2013)*

D. Taking action

To calculate medical care fees according to the To-bo-kan, a new medical fee system, the vice-principal of the hospital launched a new committee and introduced 'Disease Management MAP (MAP)', a medical information tool. The members of the committee included physicians and nurses, pharmacists, nutritionists, physical therapists, radiologist, clinical and laboratory technicians. One of the authors joined the committee as an operator of MAP. In the committee, they debated endlessly as to the potential usage of the tool.

E. Evaluation

The visualization by 'MAP' shed light on and unearthed the real medical situation in the hospital, including medical oversights by doctors – which co-medicals (non-doctors) were already vaguely aware of – and brought it out into the open.

Our evaluation is as follows: the visualization helps as a kind of safety net for doctors since the numerical information of potential patients who need to be cared for are now open to / and are shared by not only doctors but all co-medical staff.

After the introduction of MAP,

1) For doctors, the transparency of the tool and the fact that co-medical staff could act as backup provided a sense of security.
2) Co-medical staffs were able to observe and be more involved in what doctors were doing, which led to an unprecedented sense of equality with doctors.

Even though the structure (i.e. the hospital hierarchy) remains unchanged, and even if the hospital cannot easily change the traditional structure itself, with MAP's assistance, co-medical staffs have the potential to become players who can express their professional opinion to doctors on their own initiative.

VI. CONCLUSION

Team medical care is defined by the Ministry of Health, Labour and Welfare as "with a wide variety of professions engaging in mutual cooperation and sharing information about various objectives in order to reach them, providing medical care with the aim of responding appropriately to each patient's situation." [16]. The difficulty of achieving effective team medical care lies in the existence of two structures in hospitals – the hospital hierarchy, where the doctors are on top, and sectionalism – each professional belong to different divisions and have their own logics [7].

In this paper, we have shown that it is possible to change the consciousness of professionals, even under circumstances which cannot easily be changed.

Team medical care is important in order to enhance the effectiveness of medical services, and the Japanese government has been trying to incorporate team medical care into the medical system (e.g. the treatment fees paid to medical institutions under the medical insurance system).

Through the examination of a hospital's case, we tried to clarify that, with the assistance of visualization by a medical tool, co-medical staff have the potential to become players who can express their professional opinion to doctors on their own initiative.

Although we do not insist that the introduction of a new medical information tool can always change the consciousness of medical professionals, the introduction of a tool – and the visibility and transparency the tool brought about – acted as a trigger to enhance collaboration between different professionals. In a sense, the introduction of the tool – and the endless debate as to the potential usage of the tool – mediated the collaboration.

VII. FUTURE PROSPECTS

This paper used the case of a Japanese middle-sized local hospital. Comparative field research on hospitals is required to crack down on issues related to interprofessional medical work.

In addition, further study on the role of coordinators who connect effectively with different professionals is needed. In

this paper, although one of the authors, a staff of the hospital, played this role in practice, it was not possible to dive into the role of researcher-cum-practitioner. This will be the focus of further studies.

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