Physician's burning out and Human resource crisis in Japanese Hospital: Management for sustaining medical services in Japan

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Abstract

Human resource crises by collective retirement of hospital physicians are a critical issue in Japanese health care systems. System Dynamics modeling is a feasible way to understand these phenomena. Japanese health care system is confronted with not only exogenous environments but also endogenous feedbacks to build up the situation. Increasing busyness by physicians and risk of medical lawsuits and decreasing average productivity and quality of physician by hiring new physicians reinforce retirements of physicians and the retirements change the situation for the worse. To keep sustain level of physician we could find essential policies by simulation. First strategy is changing desired number of physicians with increasing of number of patients per physician. Second way is decreasing delay between retirement and hiring. This was accomplished by early recognition of physicians' busyness by hospital managers and abundant of physicians in a health care system.

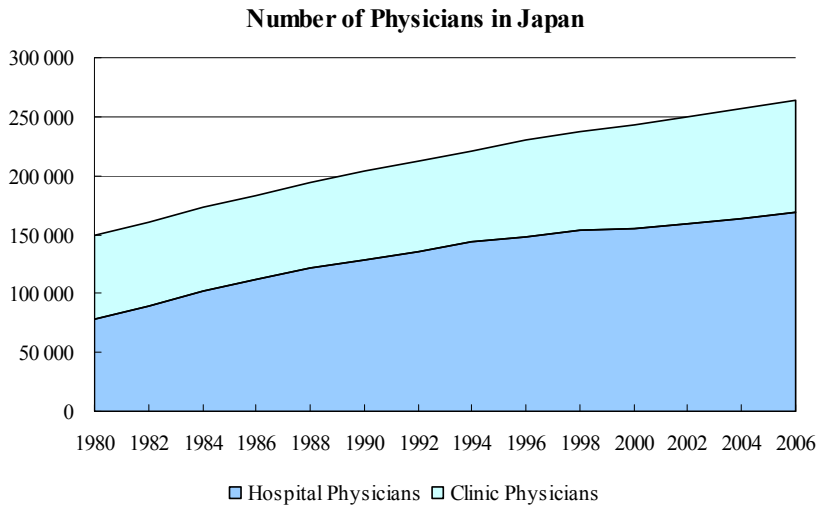
1. Introduction

Health care workers such as physicians, nurses and other co medical workers are fundamental factor to sustain health care systems. Issues on inadequacy of health care workers has been discussed long before, especially in developing countries and still an important issue to ensure enough number of physicians for health care policy (WHO 2006). Japan isn't an exception of this discussion and this issue is a major matter in Japanese health policy. Now Japanese people have been confronted with inadequacy of physicians, especially hospital physicians and, as a result, problems with this inadequacy including rejections of emergency patients and inconvenient access to medical services.

Now some Japanese hospitals are confronted to human resource crisis by collective retirements of senior physician. This phenomenon of collective retirements was called "Leaving sabotage (Tachisari-gata sabotage)" and regarded as a critical issue on health policy to be discussed. Many senior physicians have exited from hospital and start running their own clinics. Burning out of physicians by overworks is regarded as a main reason of this sabotage (Tsuruta 2007).

Figure 1 shows time trends of number of physicians in Japan. Number of both clinic physicians and hospital physicians has been increasing from 1980 to 2006. However many hospital physicians have been struggling with over work issue and this issue has been getting severe in these years. Why over works of physicians have been getting severe through these ten years?

Figure 1. Time trend of Number of Physicians



Source: Research on "Physicians, Nurses and Dentists"

by Japanese Ministry of Health, Labor and Welfare

The main reasons of over works issue are dramatic changes of environment surrounded health care system. First reason is change of demands for health care. Japanese society has charged into super-aging society and health care demands have been increasing at a faster rate. And also change of health policy by Japanese Ministry of Health, Labor and Welfare affected average length of stay of inpatients in hospitals and average length of stay decreased rapidly. This policy change has also increased number of patients and physicians' work. The accumulation of these changes has attacked physicians.

In this paper, this process was investigated by System Dynamics model. And the focus of this paper is human resource management in a hospital to understand micro level situation of human resource crisis. In chapter 2, we try to provide backgrounds information on human resource management for health in Japan to understand these issues well. In chapter 3, human resource model was elicited by causal diagram. In chapter 4, basic simulations show how these environmental changes affect and how human resource policy can change the situations.

2. Backgrounds

History of health policy for human resources for health and physicians overworks in Japan

Japanese health care system has been regarded as one of the successful health care system in the world by its high health outcomes including life expectancy, low infant and maternal mortality rate and so on (WHO 2000). According to a research enforced by World Health Organization, equity of health outcome was rated at quite high level (WHO 2000). Basically universal medical insurance system is a source of this high health outcome and equitable health care system. Japanese government has assured access to health care for every citizen by this universal medical insurance.

To assure the access to health care for all, governments need enough physicians to sustain that health care system. Issue on necessity number of physician started discussing from 1960's when Japanese government established universal health care insurance. To assure free access to health care required more number of physicians and nurses to provide these services. Japanese government established new medical schools to respond to increasing of health care demands in 1970's. The establishment of medical

schools had increased number of physicians from 4380 to 8360.

After 1980, however, the discussion went to an opposite direction. Ministry of health (Former Ministry of Health, Labor and Welfare) changed their policy in human resource management for health and decided to reduce 10% of fixed number of medical school student (Hasegawa 2005). This decision was based on an estimation of future number of physicians and the estimation showed number of physicians would be 10 % over demands for physicians in 2025. And again Ministry of health reduced 10 % of fixed number of physicians in 1997. These discussions going to an opposite direction were based on a theory in health economics named "Physician induced demands".

This theory argues that physician can create demands and more physicians lead to make more demand for health and more expenditure on health (Evans 1974, Fuchs 1978, Reinhardt 1978, Pohlmeier and Ulrich 1995). According to the theory, there is an information asymmetry between physicians and patients, therefore physicians can induce health care demand with information advantage. This theory was a doctrinaire belief of decision making on health, though many recent empirical studies had denied this assumption (Kenkel 1990, Escrce 1992, Dranove and Wehner 1994). Followed by recent crises in many hospitals, especially in obstetrics department and emergency department, Ministry of Health, Labor and Welfare changed their policy and is planning to increase fixed number of medical students.

As described above, number of physicians is determined by Government in Japan. There are two major ways to manage human resources for health. One way is Government driven management such as Japan and the other way is market driven management such as USA (Simoens and Hurst 2001). In general, physicians per population is higher in countries with market driven management of human resources for health (Simoens and Hurst 2001). Physicians per population in Japan is relatively low in OECD countries.

Recent environmental changes related to increasing of retirement

In addition to relative scarcity of physicians in Japan, many environmental changes have attacked physicians working in hospitals. In this section, these environmental changes on health care system were described.

There are four important changes occurred in Japanese health policy and system: aging, decreasing average length of stay, new intern system and collapse of "Ikyoku" and Medical lawsuits.

Aging is fundamental and noninvertible trend to understand health care system in

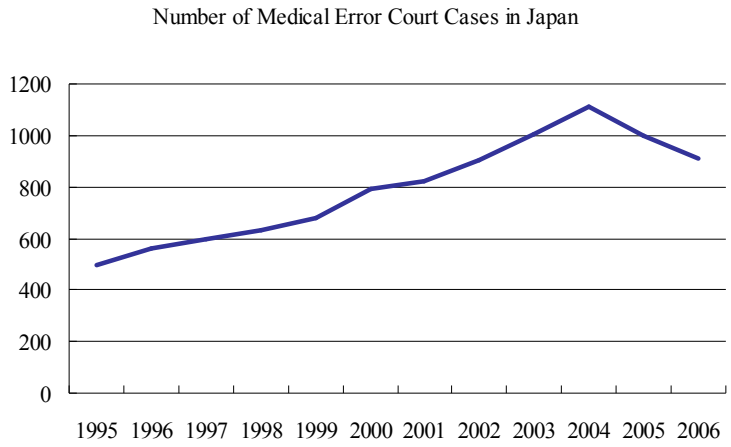
Japan and other developed countries. Aged people tend to go to and enter hospitals. Therefore, health care demands increase if fraction of aged people goes up.

Second change is on length of stay in hospitals. Average inpatient's length of stay in Japanese hospital had been decreasing from 30 days to 15 days in these 10 years because of health policy to decrease length of stay by Japanese ministry of Health, Labor and Welfare. Compared to other countries including USA and European countries average length of stay of inpatients had been quite long and regarded as a source of medical resource waste. This means total works of physicians in hospital would be almost twice if number of physicians is without change. Hospitals haven't hired physicians to adjust to this changes and total number of physicians haven't increased so rapidly. Busyness of physicians in hospital has been increasing.

Third change is new intern system and collapse of "ikyoku" as a result. Under new intern system, intern physicians can chose their hospital relatively freely compared to before. Therefore, some hospitals couldn't get new inter physicians for 2 years. Intern physicians are not well trained, but they are important human resources for hospital management. And new inter system also lead to collapse of "Ikyoku". Literal meaning of "Ikyoku" is doctor's office in university hospital, but "ikyoku" had a power to manage human resources in their area. "Ikyoku" was an hierarchical organization and had many problems including power harassments. But "ikyoku" has a positive function to arrange human resource in their area and assure universal access to health care.

Forth change is awareness of patients about medical accidents. Figure 3 shows rapid increase of medical court cases in Japan. Medical court cases had increased from 494 in 1995 to 1100 in 2004. This change is generally based on change of recognition of medical accidents by physicians and patients tend to care more about medical safety.

Figure 3. Number of Medical Court cases in Japan



Source: Japanese Supreme court home page

Table 1. Change of place to work of 30-47 years old physicians

	1996	2002	Compared to 1996
General Hospital	63673	57275	-6398 (-10.0%)
University Hospital	25665	16658	-9007 (-35.1%)
Clinic	22779	38090	15311 (67.2%)

Source: Tsuruta(2007)

These four changes have occurred coincidently and made the working environment of hospital physicians worse. As a result, many hospital physicians have exited from hospital to clinic. They have started their own clinic to work more stress less conditions. Table 1 show the tendency of decrease of hospital physicians and increase of clinic physicians. Declining senior physicians in hospital would be a crisis of human resources. From next chapter, we try to understand these phenomena and consider solutions by system dynamics.

3. Application of System Dynamics for management of human resources for health

A number of applications of System dynamics for human resources provided a foundation for the model and concept to be discussed in this paper (Homer 1985, Homer 1999, Homer et al 2007, Sterman 2000). In these models, there are common structures of model that stock is people who are currently working and flows are employment and retirements. Sterman argued human resource model on research faculty in university. In

this model, human resources in university research centers were classified by three categories based on their positions. There are many types of physicians in a hospital including staff physicians and manager physicians and well-trained physicians and intern physicians.

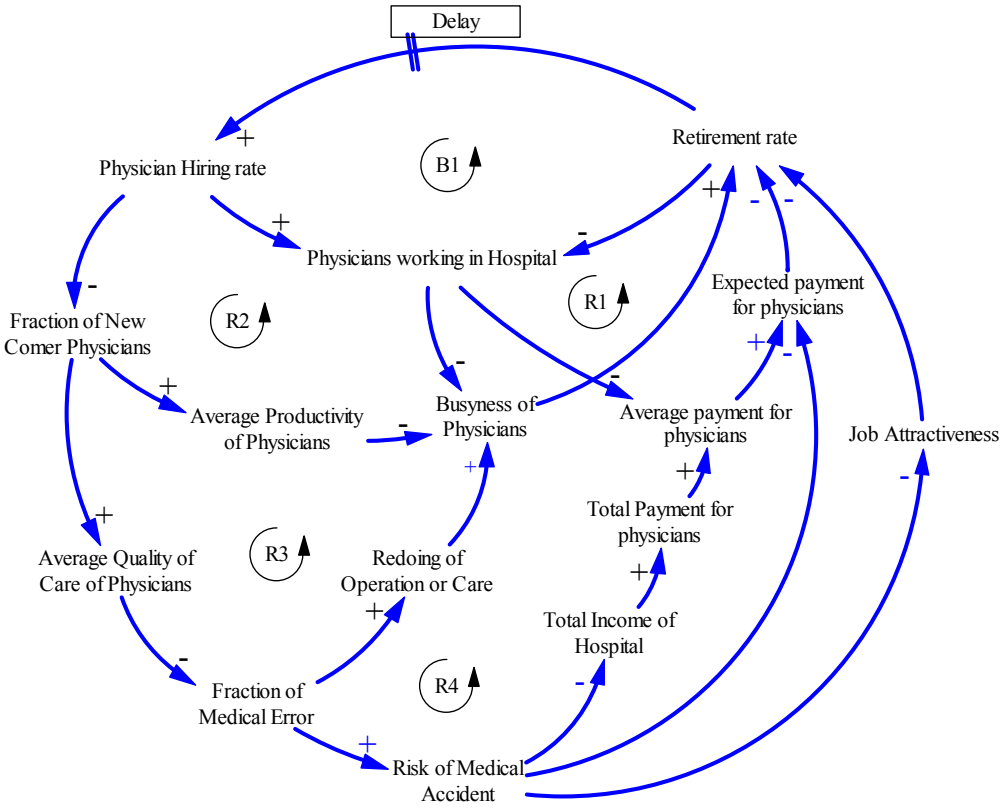
System Dynamics models for supply chain management also have a possibility to provide some implication for human resources model for health, because human resource management is, in other words, supply and demand management of labor.

In this paper, physicians hiring and retirement process in a hospital was investigated as a system dynamics model. As we mentioned human resources management for health, level of this discussion would be national or prefecture level to determine fixed number of students in medical school

Main focus of modeling in this paper is clarifying dynamics of hiring and retirement of hospital physicians. As described above, many senior physicians have retired from general hospital and university hospital and have started running their own clinics. Under this situation, many well trained hospital physicians exited from hospitals that are the basis of advanced type of health care. Therefore, it is quite important to understand how and why many senior physicians retired and how hospital managers should treat this crisis.

Figure 4 is causal diagram on retirement on hospital physicians. This basic model shows dynamics of retirement and hiring process of organizations including a balancing loop and reinforcing loops.

Figure 4. Causal Diagram of Physicians Retirement Model



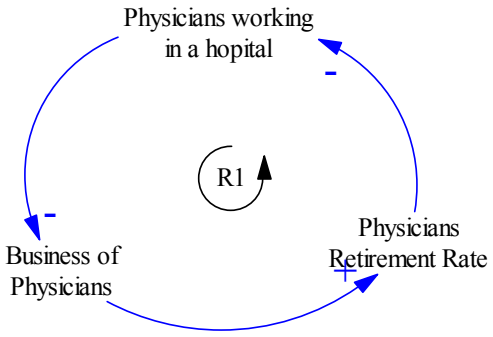
Explanation of variables

- Physicians working in Hospital = Total number of physicians working in a hospital
- Retirement rate = Number of physicians retire in a period
- Physician Hiring rate = Number of physicians hire in a period
- Average Productivity of physicians = Physicians' average number of patients ("Productivity" means just quantity of health services)
- Average quality of care by physicians = Average quality of care of physicians
- Fraction of medical error = Fraction of all kinds of medical error including small mistakes and big medical accidents.
- Redoing of operation or care = Number of redoing of operations or cares with medical error
- Risk of Medical Accident = possibility that hospital would be sued by medical accidents

(1) R1　Retirement loop

R1 is a source of dynamics of human resources management in hospitals. R1 shows that exits of physicians decrease total number of physicians in a hospital and make other physicians busier. And if physicians get busier, retirement rate would also increase. One physician's retirement accelerate retirements of other physician.

Figure 5.　　Feedback loop of physicians retirement



(2) R2　New comer physicians loop

R2 shows effects of new comers entering in a hospital. Increase of hiring rate of physicians lead to increase of new comer physicians. Productivity of new comer physicians tends to be lower than non-new comer physicians and they need a certain period to adjust to work in a new hospital. Working activities of physicians including writing medical records haven't standardized among hospitals in Japan. Each hospital has also each standard for working activities. Therefore, this adjustment time tend to be long, especially in Japan. More new comer means less average productivity of physicians and more busyness for non-new comer physicians.

(3) R3　Medical Error loop

R3 shows effects of medical error to works of physicians. Definition of medical errors is including all kinds of errors such as wrong orders, clinical decision making and medical care. To cover these kinds of error, physicians need to re-do orders, decision making and care. As we described above, average productivity of physicians would decrease if hiring rate increase. The increase of new-comer physicians affects not only quantity aspects of care (productivity) but also quality aspects of care. If average quality care of physicians decreases, possibility of medical error would rise. More medical errors lead to more re-do and busyness of all physicians.

(4) R4 Lawsuits risk loop

R4 shows effects of increase of risk of medical lawsuits to retirement rate of physicians. As we describe in chapter 2, lawsuits by medical accidents had been increased through 1990'. In some cases, physicians lost in lawsuits on medical accident. Medical lawsuits are enormous burdens on hospitals because the medical lawsuits make reputation of hospitals bad and sometimes pay reparations. These things have adverse effects to hospital management and job attractiveness of physicians.

(5) B1 Recruitment loop

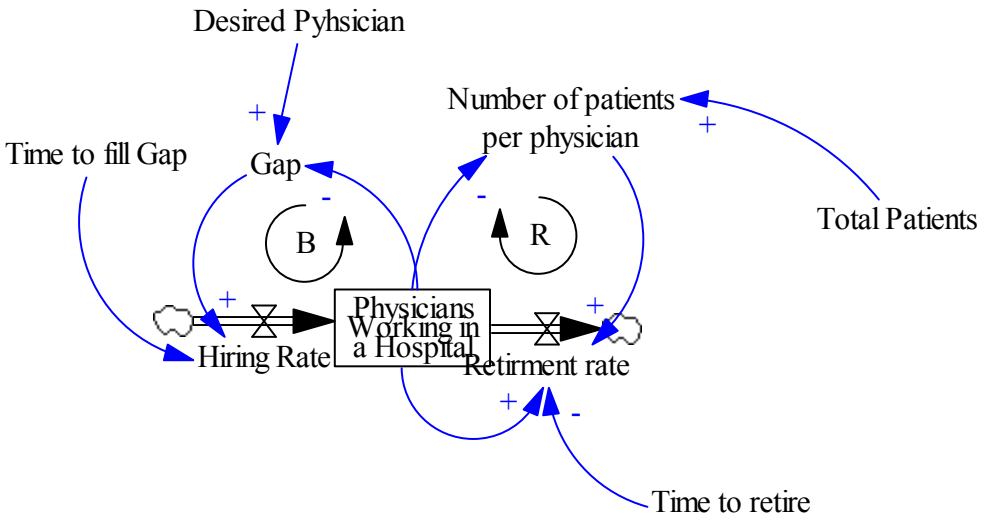
B1, differently from four loops above, is balancing loop to keep enough number of physicians to operate a hospital. B1 shows process of recruitment in a hospital to cover retirements of physicians. Recognizing gap between desired number of physicians and actual number of physicians, hospital manager or other administrative staffs try to hire physicians to cover retirements of physicians. A considerable thing is here there is a delay to fulfill the gap. This delay is basically come from two delays: recognition delay and hiring delay. Recognition delay is delay of recognizing gaps by hospital managers and hiring delay is time to hire new physicians.

In this causal diagram, there are four negative feedbacks and one positive feedback for busyness of physicians. This causal diagram shows fundamental structure to understand dynamics of human resources management in hospital.

4. Simulation of human resource management model in a hospital

Figure 6 shows basic simulation model of physicians hiring and retirement. Number of physicians working in a hospital is a stock of this model. Number of Physicians in a hospital was determined by hiring rate of new physicians and retirement rate of physicians. Retirement rate was determined by number of physicians, average time to retire and number of patients per physicians as an indicator for business of physicians. Hiring rate was determined by gap between desired physicians and actual number of physicians and time to fill the gap. Loop R reinforced a trend of retirement of physicians and Loop B is balancing loop to sustain certain number of physicians in a hospital.

Figure 6. Simulation model of physicians retirement



The followings are equations in this simulation model.

(Physicians working in a hospital)
= ∫ (Hiring rate – Retirement rate)

(Retirement rate)
= MAX (0, Physicians working in a hospital/ Time to retire + Number of patients per physician / Initial value of Number of patients per physicians * Physicians working in a hospital* retirement coefficient) (1)

(Number of Patients per physicians)
= (Total Patients / Physicians working in a hospital)

(GAP)
= MAX (0, Desired Physicians – Physicians working in a hospital)
(Hiring rate)
= MAX (0, GAP / Time to fill Gap)

Retirement coefficient in equation (1) is an indicator to show effects of increase of busyness of physicians to retirement. In this model, we used 0.2 as retirement

coefficient.

Initial value of “Physicians working in a hospital” is 100, “Total patients” is 10000, “Time to fill gap” is 2 and “Time to retire” is 10.

Hospitals are confronted with three critical issues that Japanese hospitals have actually been facing recently: New Intern System, Patients increase and Physicians Shortage.

New Intern

Japanese new intern system was introduced in 2004 and because of this new system some hospitals wasn’t able to get new intern for two years. In this model, we change equation of hiring rate to (original hiring rate – 10) from time 3 to 4.

Patients Increase

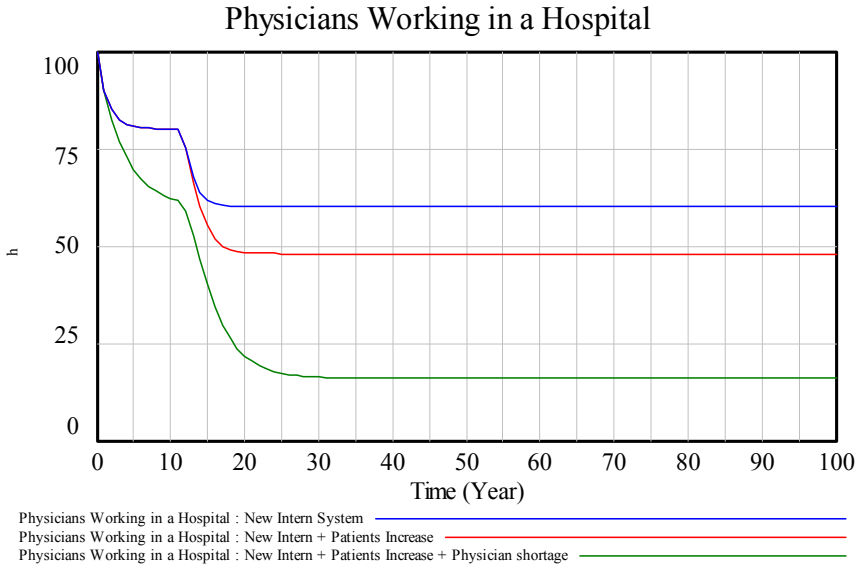
With decreasing length of stay, average inpatients per physicians had been increasing rapidly in Japan. To investigate an effect of this change, total number of patients was changed and added 1500 per year from time 10 to 13.

Physician Shortage

Japanese health care system is confronted with shortage of physicians, especially in rural area. It is sometimes quite difficult to find and hire new physicians. To investigate this situation, “time to fill gap” was changed from 2 to 4 through all time.

Figure 7 is the result of simulation of number of physicians working in a hospital. Blue line shows trend of physicians’ number in introducing new intern system. Two year decreasing hiring rate leads to significant drop of hospital physicians. From time 5 to 10 the line is approximately horizontal. But after time 10 the line was decreasing again because of a feedback effect of retirement before. And steady state level also changed and new steady state is 62 physicians in a hospital. Red line shows the number of physicians in introducing new intern system and increasing number of patients. Number of patients was increasing from time 10 to 13. Number of physicians had decreased rapidly from time 10.

Figure 7. Simulation result of Physicians working in a hospital in three scenarios.

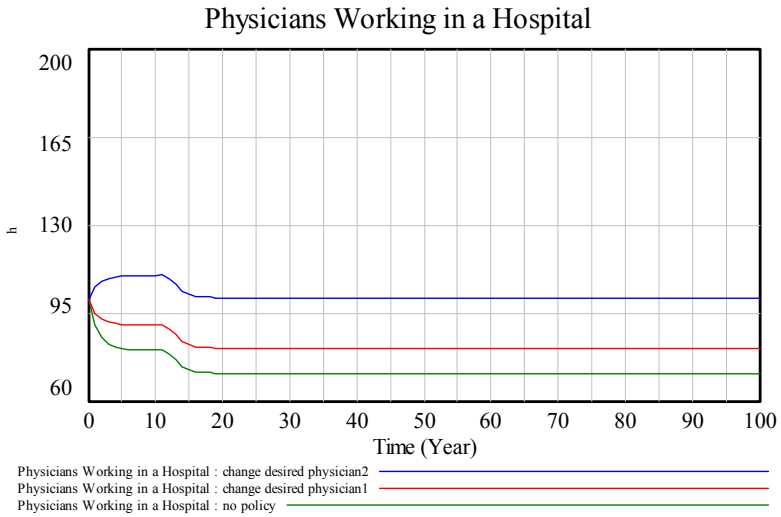


Final scenario is with introducing new intern system, increasing patients and physician's shortage. This scenario can be regarded as a model to investigate the situation of hospital in Japan. In this scenario, "time to fill gap" was changed from 2 to 4 because of physician shortage. Green line is a result of this simulation. The shape of line is similar to the shape of red line, but slope is more vertical than other lines. This results show delay would be a critical factor to manage human resources in a hospital. All three scenarios show any changes on the human resources system have some effects to decrease level of physicians rapidly and steady state level of physicians in a hospital.

The situations of all scenarios reach a crisis proportion of physicians in a hospital, especially green line. Number of patients per physicians increased rapidly and burdens to physicians Hospital manger need to make some decision makings to fill gaps. What are the nice policies to recover level of physicians?

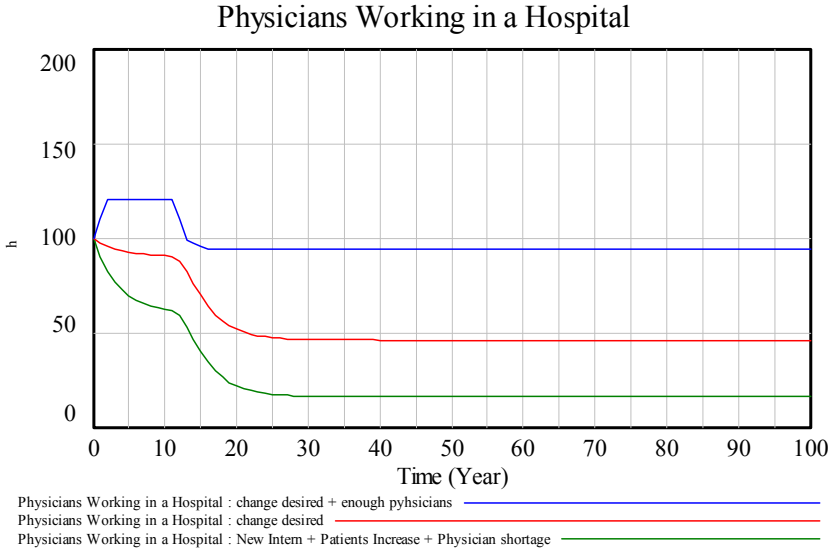
There are some possible ways to adjust this situation. First way is changing desired physicians of a hospital. By changing desired number of physicians hospitals hire more physician than before. Figure 8 and 9 show the results of changing desired number of physicians. In figure 8, green line shows the result of simulation in introducing new inter system. Red line show the result in changing desired physicians to 110 and blue line shows the result of changing desired physicians to 130. In red line case the situation of human resources is better than that in green line. However steady state level is still under 100. In blue line case, number of physicians increased from time 1 to 10 and declined to steady state level that is same as initial value of physicians.

Figure 8. Simulation result of changing desired physicians



To adjust crisis coming from outside shocks, changing desired physicians enough is considerable way. Issues to be discussed here is difficulty to recognize desired number of physicians by hospital managers. Introducing new intern system just was recognized as decrease of 20 new hiring of physicians. Therefore, if they changed desired physician, the value of change would be 10 or 20. But to keep a steady state that is same as initial value manager need to change desired more and keep their mind if actual number of physicians is go beyond initial value.

Figure 9 simulation result of changing time to fill gap



From point of view of hospital manger, changing desired is a way to adjust the sudden change of human resources and they can't change the time to fill gap because this variable depends on total number of physicians in a prefecture or countries. If more physicians are in a country, a hospital can hire new physician easily in the country. Figure 9 show this situation. Red line shows result in changing desired number of physicians. Blue line shows result in changing desired number of physicians and changing time to fill gap from 2 to 1 that means enough physicians are in a country and hospital can hire physicians whenever they want.

Figure 10. Result of simulation of number of patients per physician

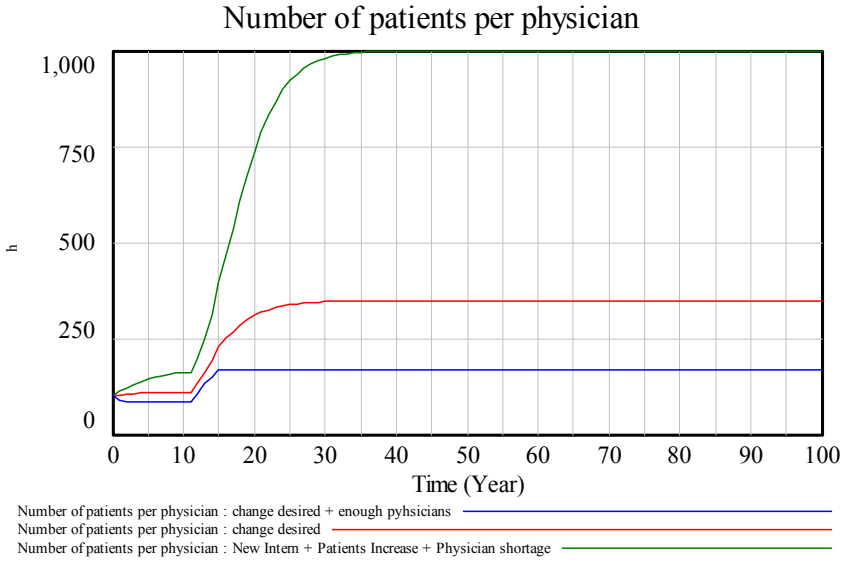


Figure 10 is the result of simulation on number of patients per physician. This figure also shows "enough physicians policy" that cut down time to fill gap lead to more stable situation than other cases.

5. discussion

The result of simulation shows changes in hiring or retirement have dynamic effects to the hospital system and change steady state level of physicians in a hospital. Business of physicians loop was emphasized here, but other loop including new comer physicians loop, medical error loop and so on would also have considerable effects to hospital management systems.

There are four implications from causal diagram and simulation model. First, to adjust crisis of shortage of physicians, hospital manager should change their recognition of desired number of physicians immediately and keep the level of desired physicians when number of physicians would be stable.

Second, as simulation in chapter 5 shows, abundant human resources contribute to stability of human resource system in hospitals. Delay tends to be a cause of system instability. Keeping enough level of physicians has a good effect to human resource management.

Third, the other indicator can be changed should also be improved by health policy and management. By improving average productivity or establishing a system associated with medical lawsuits the effects of negative feed backs would decrease.

The model used in this analysis is straight forward model. To focus the dynamics of physicians, retirement we used a simple model. More complicated model would be needed to determined exact number of desired physicians in a hospital and country. (see Appendix). System dynamics model give us a critical insight of process of human resource management. To keep health care system sustainable we need deeper understanding and recognition of this issue.

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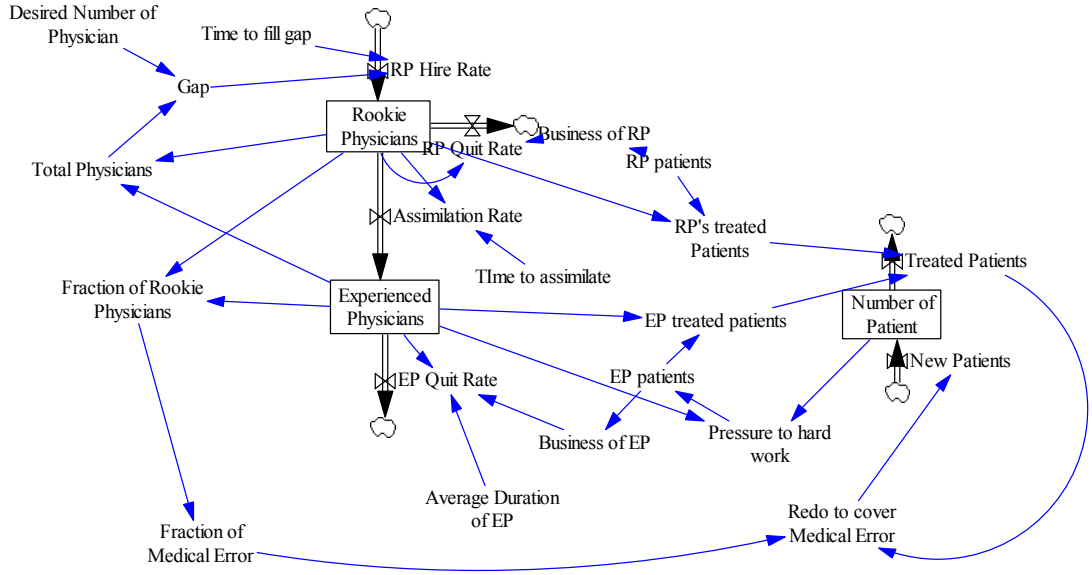
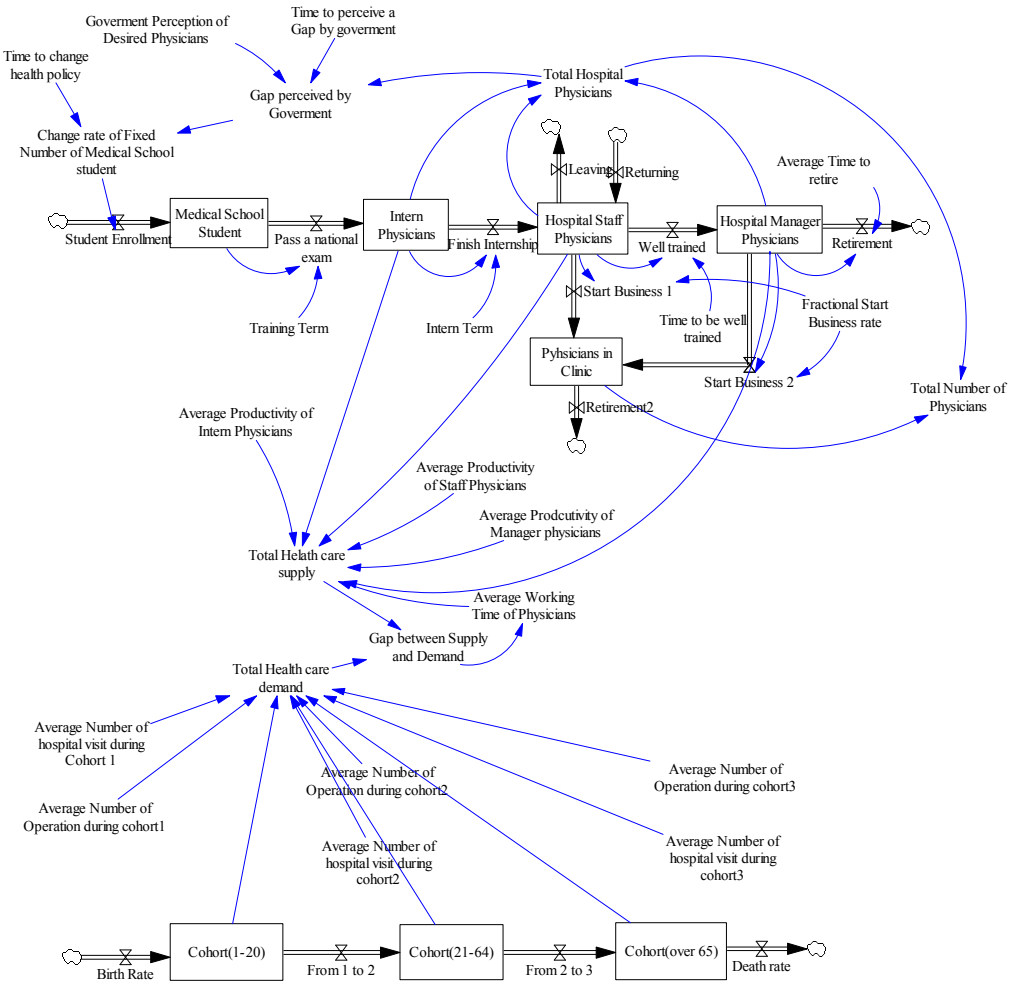
Appendix

(1) 2 stage model of human resources for health



In this model, physicians are classified by two stage: Rookie and Experienced. This model is based on Sterman (2000)

(2) Demand and supply model of human resources for health



Supply is determined by demand. This model are consists of supply and demand of health services.