

Article

Sustainable Hospital Management by a Cross SWOT Analysis in a Medium-Sized Hospital

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Abstract: The medical working environment in small and medium-sized hospitals is becoming more intense, and the coronavirus epidemic has threatened the hospital management base in Japan. To establish the future sustainable management of hospitals using internal and external environmental data, a cross SWOT (Strengths, Weaknesses, Opportunities and Threats) analysis may be a very useful tool. A cross SWOT analysis considers four strategies: an offensive strategy (SO), a confrontation strategy (ST), a strengthening strategy (WO) and a defense strategy (WT). Here, using a cross SWOT analysis, we consider the future direction of an older medium-sized hospital as one case. The most important issue is to balance the interests of hospital management with those of patients. As a sustainable strategy for this purpose, we forecast the medical situation in the Fukuoka-Itoshima Medical Area, including the Fukuoka-Nishi area in Japan, and the future profitability of a medium-sized hospital for the next 30 to 40 years. Based on the data, we used a cross SWOT analysis to analyze the current situation at the hospital and formulated measures to realize innovations at the hospital that respond to the needs of patients and the community. According to this analysis, for the future sustainable management as a hospital, we should plan to become a more community-based by increasing our capacity to treat elderly inpatients and outpatients with cardiovascular, gastrointestinal and respiratory diseases and to increase the number of beds dedicated to community comprehensive care. Furthermore, through close cooperation with highly specialized and advanced medical institutions, we need to create a new type of regional medical cooperation that can bridge the gap between regional medical care and advanced medical care. We also need to open a cardiovascular-rhythm center and a gastrointestinal endoscopy center and establish an appropriate working system for staff. The future direction for this older hospital should include plans for relocation and reconstruction, considering the balance between expected changes in income and expenses. In conclusion, we performed a cross SWOT analysis with SO, ST, WO and WT. The analysis can be a very useful tool for planning the future direction of hospitals using internal and external environmental data, and our older hospital should eventually be able to achieve sustainable developmental innovations by rebuilding while working on various strategies.

Keywords: medium-sized hospital; regional medical cooperation; Fukuoka-Itoshima medical area; developmental innovation; cross SWOT analysis



Citation: Miura, S.-i.; Nose, D.; Kanamori, K.; Imaizumi, S.; Shimura, H.; Saku, K. Sustainable Hospital Management by a Cross SWOT Analysis in a Medium-Sized Hospital. *Sustainability* **2021**, *13*, 13042. <https://doi.org/10.3390/su132313042>

Academic Editor: Lotfi Aleya

Received: 24 October 2021

Accepted: 22 November 2021

Published: 25 November 2021

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1. Introduction

Japanese hospitals are divided into three groups according to their functions: general hospitals, regional medical support hospitals and advanced treatment hospitals [1]. There

are three hospitals at Fukuoka University (FU) located in Fukuoka City, Fukuoka Prefecture, on Kyushu Island, which is located in the south of Japan, including FU Hospital, which is a highly specialized and advanced treatment hospital; FU Chikushi Hospital, which is a regional medical support hospital; and FU Nishijin Hospital (FUNH), which is a general hospital. The three hospitals are developing “Patient-centered medical care” as their slogan.

While FUNH, a medium-sized hospital, opened on 1 April 2018, the building itself was constructed in 1983 and is now dilapidated. This older hospital provides medical care to patients who have been referred from other hospitals or clinics. It is also capable of providing primary and secondary emergency medical care. On the other hand, small and medium-sized hospitals, compared to large hospitals, generally have a lower revenue per bed [2]. If we consider the total number of hospitals and the percentages of hospitals that operate under a deficit and those that operate with a surplus according to size, a higher proportion of smaller hospitals operate on a deficit [3,4]. Furthermore, the medical working environment is becoming more intense, and the coronavirus epidemic has threatened the management base. It is important to balance the interests of hospital management with those of patients.

To date, small and medium-sized hospitals have sought to improve management through specialization in specific fields, such as diabetes or respiratory care, and by flattening the organization through the use of information technology [5]. Thus, a distinctive management reform strategy has been reported. According to the vital trends in Japan, the proportion of aged residents may continue to rise as the total population declines [6]. Based on these facts, unique sustainable management innovation strategies are required using internal environmental data (the number of outpatients and inpatients, the number of newly admitted patients, the number of discharges, hospitalizations, discharge routes, number of examinations, number of operations, sales, unit price of medical care, etc.) and external environmental data (population transition, medical treatment rate, etc.). In December 2018, the establishment of the “Basic Law Concerning Measures for Stroke, Heart Disease and Other Cardiovascular Diseases to Extend Healthy Life” [7,8] helped to clarify the role of hospitals in patient and community medicine.

At FUNH, a SWOT (Strengths, Weaknesses, Opportunities and Threats) analysis [9] can be performed based on various medical practice data. The importance of different approaches in hospital management innovation has been reported in small and medium-sized hospitals [10,11]. In this report, we discuss our old community-based hospital as a case for a cross SWOT analysis that considers four strategies: an offensive strategy (SO), a confrontation strategy (ST), a strengthening strategy (WO) and a defense strategy (WT) [12]. As a way for small and medium-sized hospitals to survive in a difficult business environment, the most important approach is to make the most of the characteristics of their own hospital, which are likely different than those of large hospitals, and to differentiate themselves from other hospitals. Such hospitals could specialize in advanced technology to provide advanced medical care with a single department or a small number of departments or could seek to be a network-compatible community-based hospital with multiple clinical departments that aim to collaborate with regional medical institutions [11]. In addition, it is necessary to swiftly respond to external environmental factors and formulate a strategy that is closer to the community.

Here, with a view to sustainable hospital management and patient interests, we propose a management innovation approach to specialize and consolidate medical care at FUNH by a cross SWOT analysis, plan to create a center, optimize work efficiency and labor costs for doctors and medical staff, and also reduce medical costs. Strengthening our function as a support hospital and reviewing the organizational structure is discussed from the perspective of unique management innovation strategies using internal and external environmental data. Furthermore, we also discuss whether FUNH should be rebuilt, since the building itself is now dilapidated. In this paper, we tested the hypothesis that a cross SWOT analysis is a very useful tool for future sustainable management of hospitals using internal and external environmental data as one case.

2. Materials and Methods

To obtain information on demographic and medical dynamics in Japan, Fukuoka city, and its suburbs, we consulted e-Stat (the Japanese Government Statistics Portal Site), the National Institute of Population and Social Security Research, Fukuoka City database [13,14], and the database website published by Dr. Koichi B. Ishikawa [15]. These data were also illustrated using QlikView® (QlikTech International AB: King of Prussia, PA, USA) as previously described [16]. Data were obtained on the nationwide urban topography, population distribution, hospital distribution and number of beds, along with, for each ward of Fukuoka City and its suburbs, the population distribution, hospital distribution and number of beds, population forecast and forecast numbers of inpatients and outpatients (by medical area, age, gender and disease).

From the records of FUNH, we collected data such as the number of outpatients and inpatients (regional distribution, age, gender, kinds of diseases and treatments), length of hospital stay for inpatients and the actual working conditions of doctors. We also analyzed the patient distribution and share of the hospital's medical area for each ward of Fukuoka City. The periods April 2018–March 2019, April 2019–March 2020 and April 2020–2021 were defined as the years 2018, 2019 and 2020, respectively. Based on the results, we analyzed the current situation at FUNH by a SWOT analysis [9]. In addition, we mainly discussed community-based hospitals through a cross SWOT analysis [12].

Statistical analyses were performed by a one-sample t-test and unpaired t-test as appropriate. A value of $p < 0.05$ was considered significant. Based on the number of inpatients at FUNH in 2020 and the forecast for inpatients in the Fukuoka city area, we calculated the number of inpatients at FUNH in 2030 and 2040 according to the growth rate.

This research was judged by FU Medical Institutional Review Board to be “A research plan that does not require ethical review”. Therefore, we retrospectively analyzed the data and discuss the innovations of FUNH.

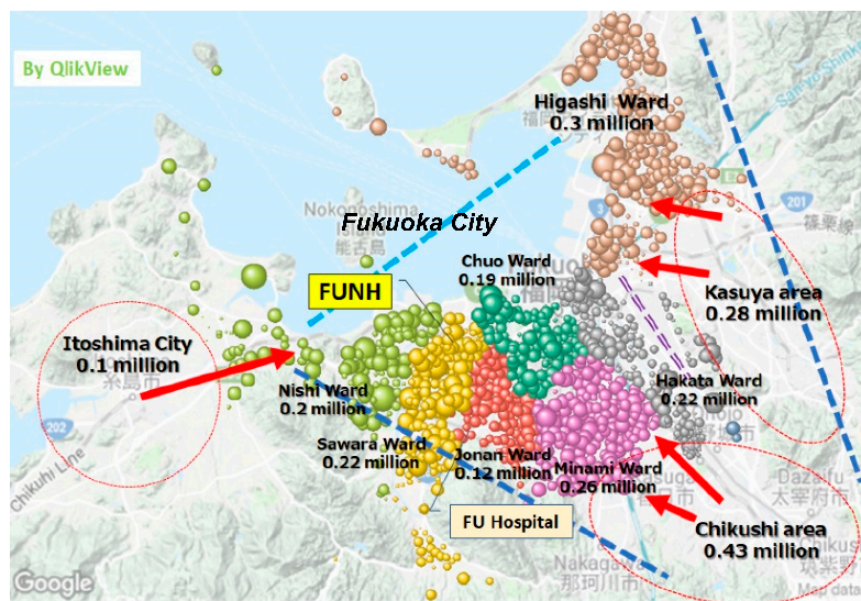
3. Results

3.1. Vital Statistics of Fukuoka City and Its Suburbs, Distribution of Hospitals, Number of Beds and Population Forecast in Fukuoka-Itoshima Secondary Medical Area

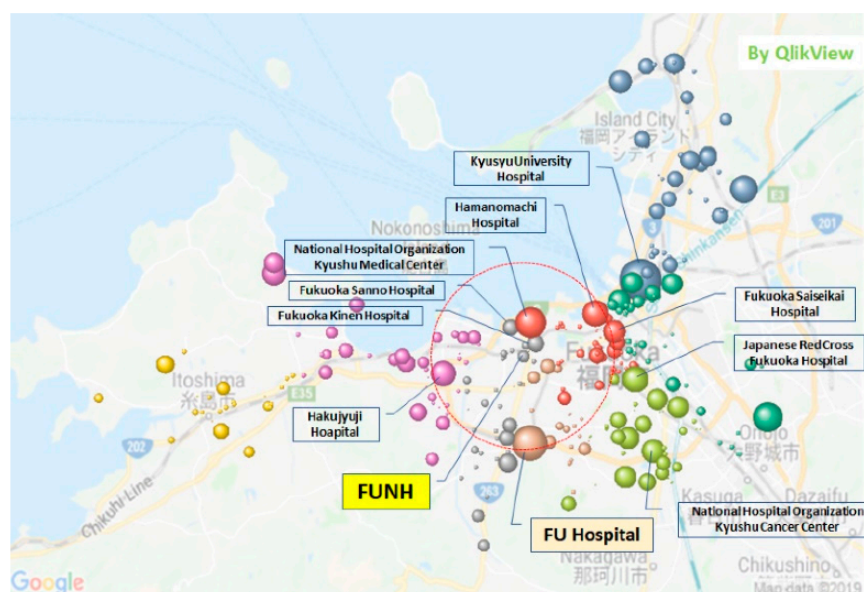
In 2015, the population of Fukuoka City and its suburbs was approximately 2.3 million, including 1.5 million in Fukuoka City itself (Sawara Ward, Nishi Ward, Jonan Ward, Chuo Ward, Minami Ward, Higashi Ward and Hakata Ward) and 0.8 million in its suburbs (Kasuya area, Chikushi area and Itoshima City) (Figure 1A). The target population of FUNH is located in Sawara Ward, with a population of 0.22 million, around 0.2 million in Nishi Ward, 0.12 million in Jonan Ward, about 0.1 million in half of Chuo Ward and 0.1 million in Itoshima City. The total number is 0.74 million (in this study, Sawara Ward, Nishi Ward, Jonan Ward, half of Chuo Ward, and Itoshima City are defined as the western part of Fukuoka). In terms of the distribution of hospitals and the number of beds in the Fukuoka-Itoshima secondary medical area in 2016, the Kyushu Medical Center occupies a large position around FUNH, followed by Fukuoka Sanno Hospital and Fukuoka Kinen Hospital (Figure 1B). The White Cross Hospital, Hamanomachi Hospital, Saiseikai Fukuoka General Hospital, etc., are located fairly distantly. Sawara Ward had a significantly low number of beds per 1000 people (at 9.89) (Figure 1C).

As shown in Figure 2A, by 2045, the populations aged 0–14 and 15–64 will have begun to decline in the Fukuoka-Itoshima secondary medical area, whereas the population aged 65–74 will slightly increase and that aged 75 and over will nearly double. By gender, in the 2045 distribution of both males and females, the population aged 75 and over increased from the previous distribution, and the change in the population of elderly females is particularly remarkable (Figure 2B). Furthermore, according to the population forecasts for Nishi Ward, Jonan Ward, Chuo Ward and Itoshima City, in addition to Sawara Ward in the western part of Fukuoka, which is the medical area of FUNH, the same tendency was seen (Figure 2C).

A.



B.



C.

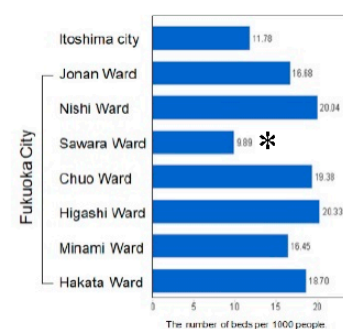
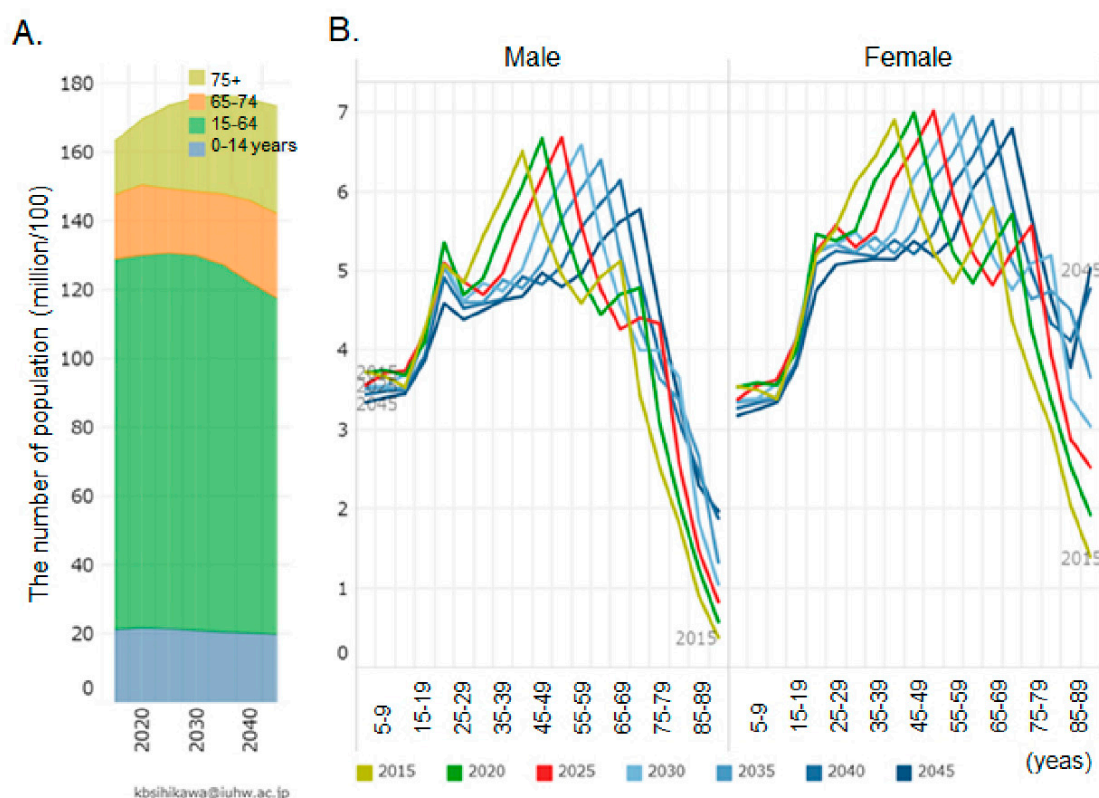


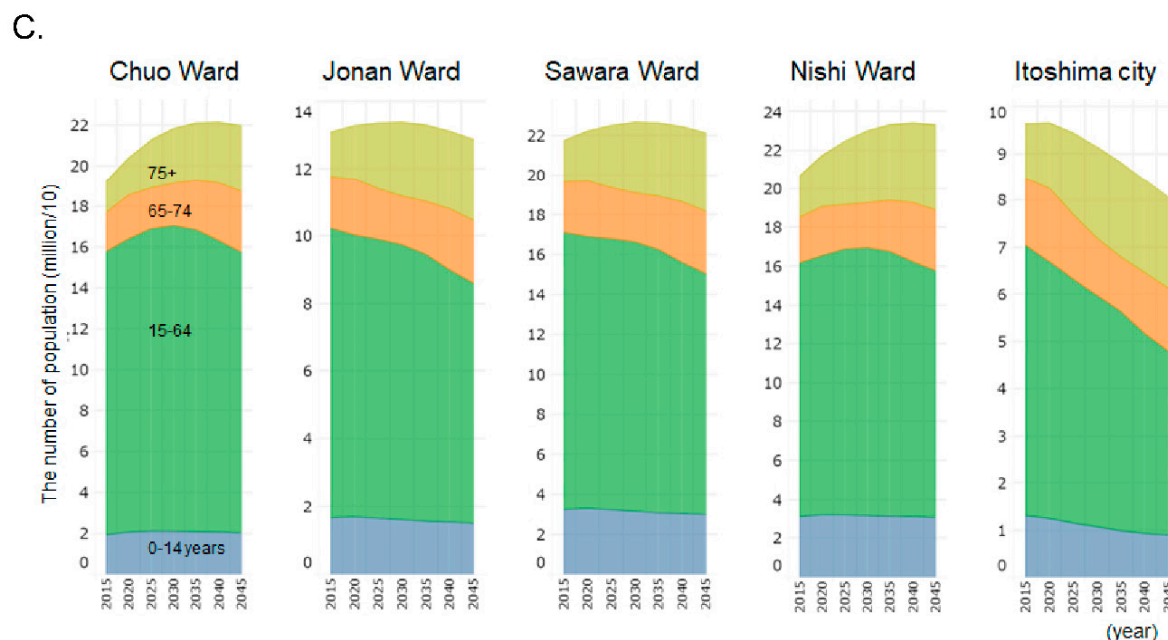
Figure 1. (A) Vital statistics of Fukuoka City and its suburbs; (B) Distribution of hospitals and number of beds in Fukuoka-Itoshima secondary medical area; (C) Number of beds per 1000 people in Fukuoka-Itoshima secondary medical area. * $p < 0.05$ vs. others.

3.2. Medical Dynamics in Fukuoka City and Its Suburbs

According to the forecast of the number of inpatients and outpatients in the Fukuoka-Itoshima secondary medical area (Figure 3), the number of inpatients and outpatients will increase as a whole, while the number of outpatients will level off in 2040. However, the number of inpatients aged 65 and over will continue to increase. Similar trends are expected for those aged 75 and over. Sawara Ward, Nishi Ward, Jonan Ward and Chuo Ward but not Itoshima City show the same tendency (data not shown).



Data Source: National Institute of Population and Social Security Research: Future Estimated Population by Region in Japan (2018 Estimate) <http://www.ipss.go.jp/pp-shicyoson/j/shicyoson18/t-page.asp>



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Figure 2. Population forecast for the Fukuoka-Itoshima secondary medical area (A,B) and the western part of Fukuoka (C).

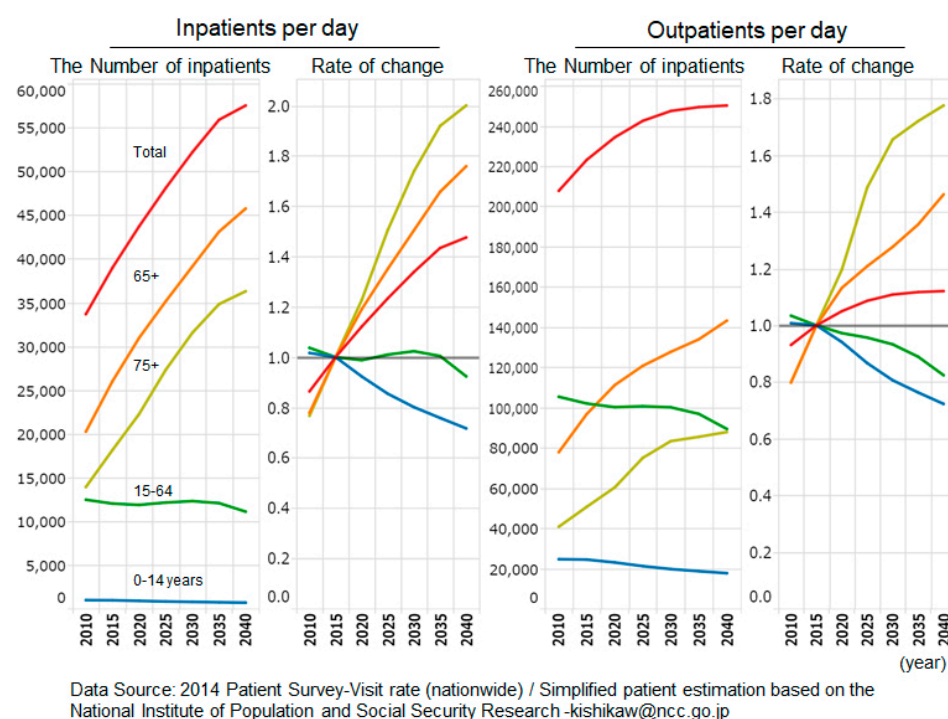
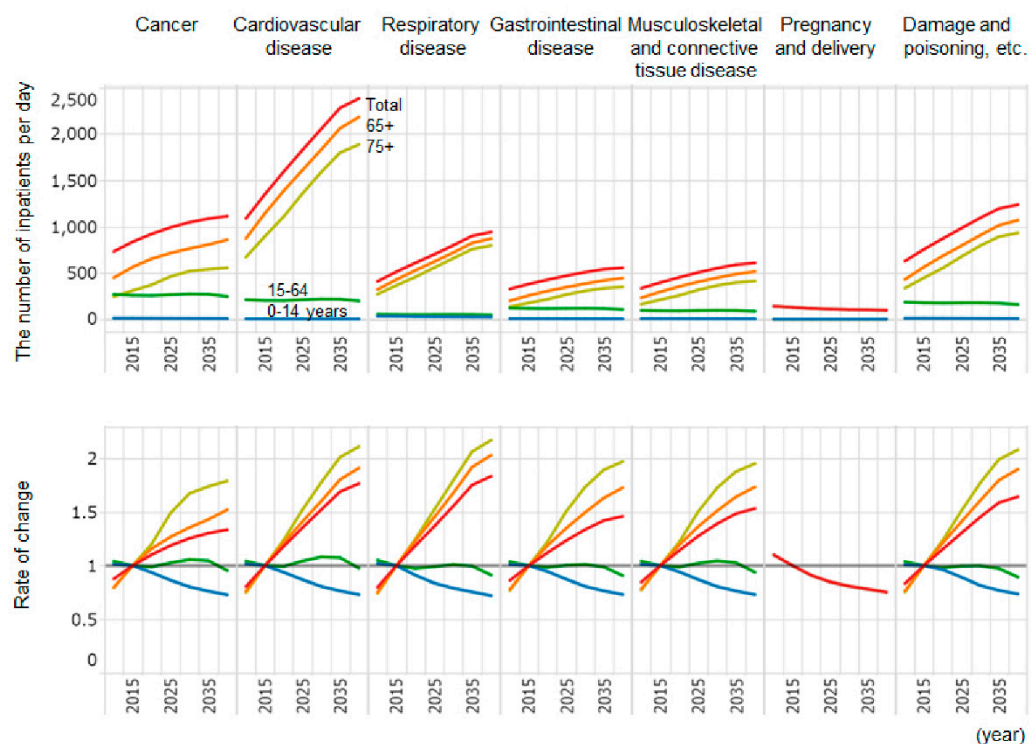


Figure 3. Forecast for inpatients and outpatients in the Fukuoka-Itoshima secondary medical area.

The specialized fields of internal medicine at FUNH are cardiovascular diseases, gastrointestinal diseases, respiratory diseases and endocrinological and diabetic diseases. Figure 4 shows the estimated number of inpatients according to the disease including cardiovascular disease, gastrointestinal disease and respiratory disease in the western part of Fukuoka. The rate of change in the number of patients is increasing for each disease category, except for pregnancy and delivery. In particular, in terms of the actual number of patients, the number of inpatients aged 65 and over with cardiovascular disease will increase significantly by 2040, especially for those aged 75 and over. There is also expected to be a large increase in the number of patients with respiratory disease and a slight increase in the number of hospitalized patients with gastrointestinal disease. The numbers of patients with neoplasms and diseases of the musculoskeletal system and connective tissue are also increasing. In addition, neurological diseases, cerebral infarction in particular, are also increasing; in 2040, the prevalence is expected to be about 1.5 times higher than that in 2015 (figure not shown). Among cardiovascular diseases, the number of hospitalizations for heart failure in patients aged 65 years or older, especially in those aged 75 and over, will increase significantly in the Fukuoka City area (Figure 4B). The number of patients with acute myocardial infarction and angina pectoris in the hospital in 2040 is expected to be about 1.5 times higher than that in 2015. In Fukuoka City, heart failure is the number one target disease in the category of cardiovascular disease, and acute myocardial infarction and angina pectoris are also important targets.

A.



B.

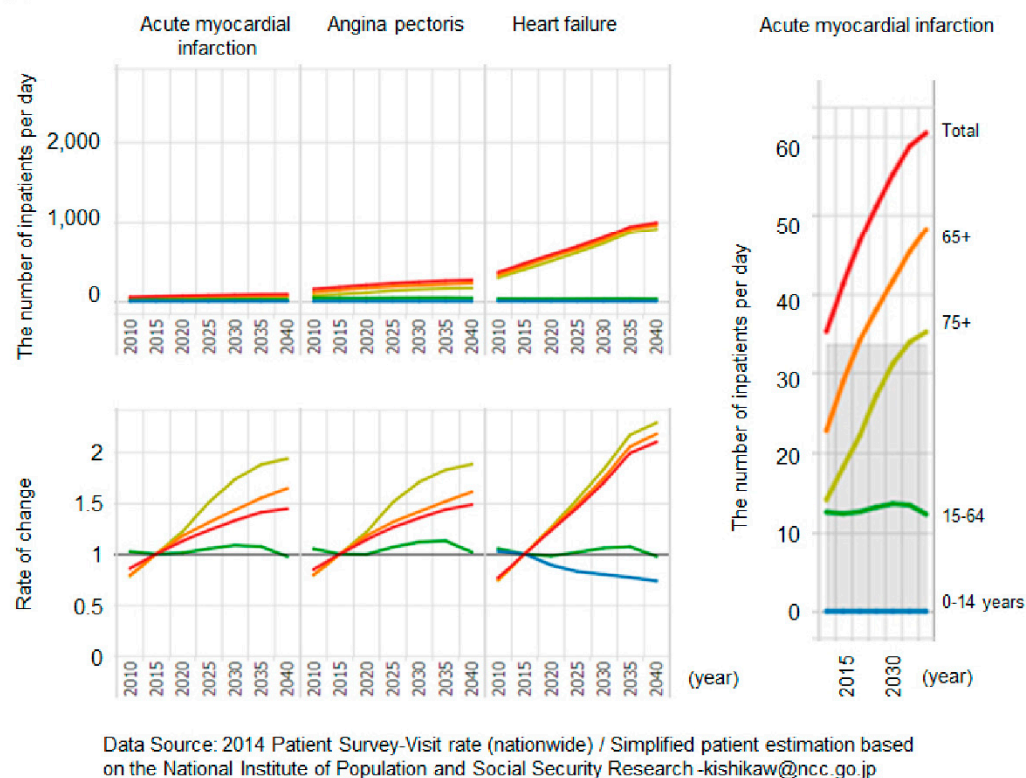


Figure 4. (A) Forecast of the number of inpatients in the western part of Fukuoka according to the disease; (B) Forecast of the number of inpatients in the Fukuoka city area for each cardiovascular disease.

3.3. Numbers of Outpatients and Inpatients for All Patients, Males and Females, at FUNH

Table 1 shows the numbers of outpatients and inpatients for all patients, males and females, at FUNH. The numbers of all outpatients and inpatients at FUNH were about 20,000 and 3000, respectively, although the number of all inpatients was 2345 in 2020 because of the coronavirus epidemic. The numbers of all male outpatients and inpatients were both higher than those of females. In the Division of Cardiology, the numbers of all outpatients and inpatients were about 5500–5800/year and 850–950/year for the past 3 years, respectively. The numbers of all male outpatients and inpatients were both higher than those of females in the Division of Cardiology.

Table 1. Numbers of outpatients (A) and inpatients (B) for all patients, males and females, at FUNH from April 2018 to March 2021.

(A) Outpatients									
Year	Total			Total, Except for Children			Division of Cardiology		
	All Patients	Males	Females	All Patients	Males	Females	All Patients	Males	Females
2018	20,971	12,201	8770	20,970	12,200	8770	5098	2966	2132
2019	21,185	11,723	9462	21,183	11,723	9460	5463	3167	2296
2020	19,509	10,897	8612	19,501	10,894	8607	5843	3380	2463
Year	Total				Division of Cardiology				
	75+ Years	65–74 Years	15–64 Years	0–14 Years	75+ Years	65–74 Years	15–64 Years	0–14 Years	
2018	6353	5832	8728	58	2055	1352	1653	38	
2019	6621	5815	8694	55	2296	1359	1783	25	
2020	6271	5510	7691	37	2620	1459	1743	21	
(B) Inpatients									
Year	Total			Total, Except for Children			Division of Cardiology		
	All Patients	Males	Females	All Patients	Males	Females	All Patients	Males	Females
2018	3234	1688	1546	2625	1368	1257	951	502	449
2019	3049	1610	1439	2383	1259	1124	892	477	415
2020	2345	1271	1074	1963	1076	887	848	461	387
Year	Total				Division of Cardiology				
	75+ Years	65–74 Years	15–64 Years	0–14 Years	75+ Years	65–74 Years	15–64 Years	0–14 Years	
2018	1312	564	748	610	542	210	198	1	
2019	1229	536	617	667	498	211	183	0	
2020	1008	480	475	382	501	192	155	0	

3.4. Regional Distribution of Outpatients and Inpatients at FUNH in 2018–2020

Most outpatients who use FUNH come from Sawara Ward, such as from Sohara, Nishijin, Takatori, Iikura and Hara. Many outpatients come from Befu, Torikai and Ohori near Sawara Ward (Figure 5A). Outpatients also come from the area along the bus route to Nishijin, such as from Noke and Tamura. As shown in Figure 5B, the regional distribution of inpatients was similar to that of outpatients.



Figure 5. Regional distribution of outpatients (A) and inpatients (B) at FUNH in 2018–2020.

3.5. Regional Distribution of All Outpatients, All Inpatients and Inpatients with Heart Failure at the Division of Cardiology at FUNH in 2018–2020

Next, we consider the distribution of outpatients and inpatients in the cardiovascular field. Similar to the distribution of all outpatients and inpatients at FUNH, in the western part of Fukuoka, most outpatients and inpatients in the cardiovascular field came from Sawara Ward around FUNH (Figure 6A,B). The regional distribution of heart failure inpatients (Figure 6C), which is expected to be quite large in the future, was similar to that of all inpatients at the Division of Cardiology.

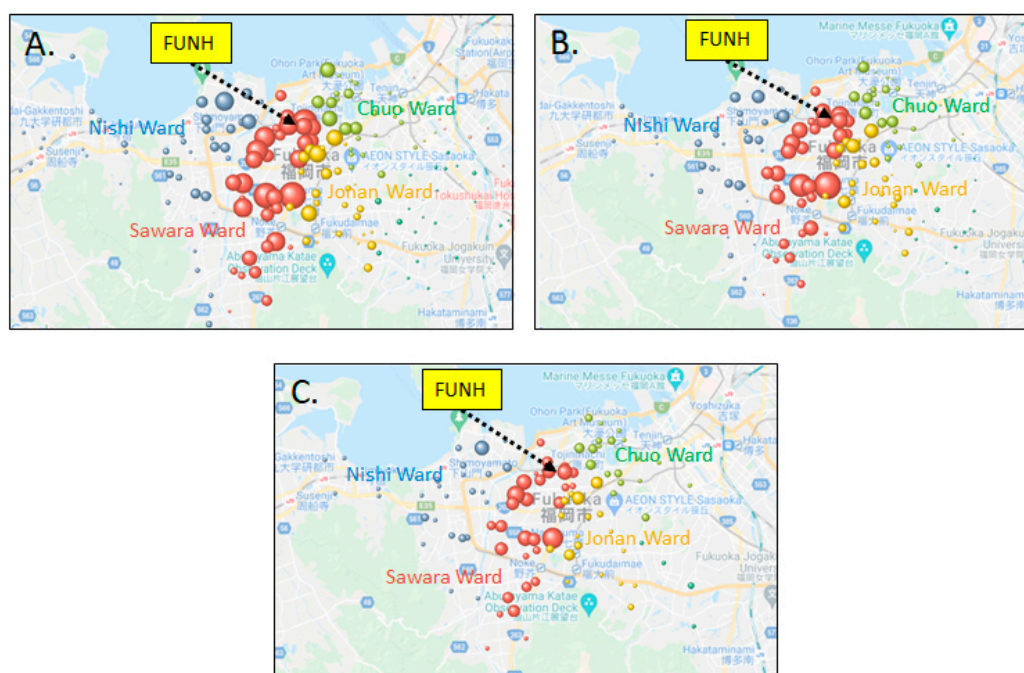


Figure 6. Regional distribution of all outpatients (A), all inpatients (B) and inpatients with heart failure (C) at the Division of Cardiology at FUNH in 2018–2020.

3.6. Three-Year Trends in Major Outpatient and Inpatient Diseases at FUNH

Figure 7 shows patients admitted to FUNH in 2018, 2019, and 2020 according to the disease type. The top five diseases were colon polyp, angina pectoris, pneumonia, heart failure, and acute coronary syndrome. Among them, heart failure increased sharply over the past three years, and pneumonia decreased significantly in 2020 because of the coronavirus epidemic. The other three diseases showed little changes.

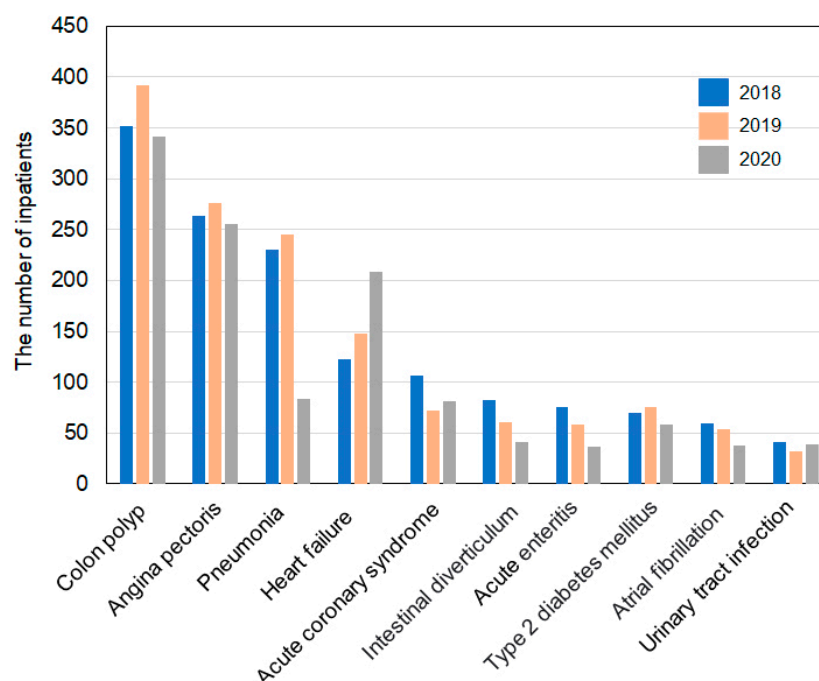


Figure 7. Numbers of inpatients with the 10 most common diseases at FUNH in 2018, 2019 and 2020.

3.7. Changes in the Average Length of Stay and Changes in the Number of Inpatients and Age with Acute Coronary Syndrome, Angina Pectoris and Heart Failure over the Past 3 Years and the Estimated Number of Inpatients with Angina Pectoris and Heart Failure in 2030 and 2040 at the Division of Cardiology at FUNH

The average values for the length of stay in 2018, 2019 and 2020 are shown in Figure 8A. The average length of stay for all inpatients was about 11 days and that in the Division of Cardiology was about 1 day longer (about 12 days). The length of stay for patients with heart failure in 2018, 2019 and 2020 was 23.5 ± 14.4 days, 22.6 ± 13.0 days and 21.8 ± 14.7 days, respectively. Thus, the average length of stay for patients with heart failure was significantly long compared to those for all inpatients in each year at the Division of Cardiology.

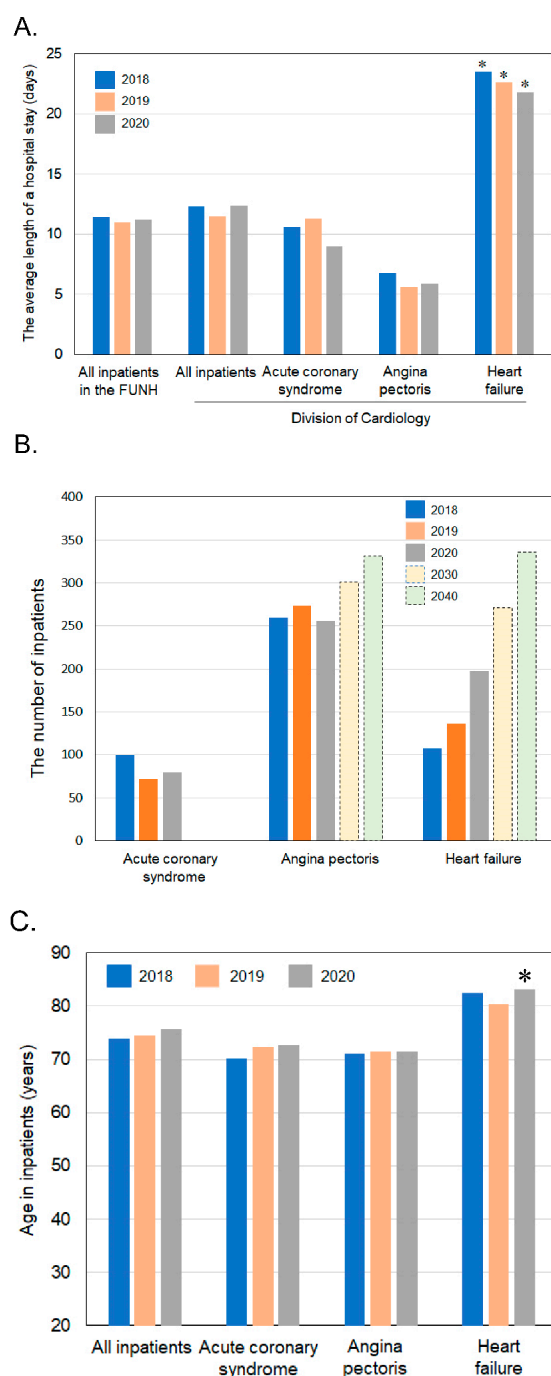


Figure 8. (A) Average length of a hospital stay at FUNH in 2018, 2019 and 2020. * $p < 0.05$ vs. all inpatients at Division of Cardiology in each year. (B) Number of inpatients with acute coronary

syndrome, angina pectoris and heart failure at the Division of Cardiology in FUNH in 2018, 2019 and 2020. The forecast of number of inpatients with angina pectoris and heart failure at the Division of Cardiology in FUNH in 2030 and 2040. (C) Age of inpatients, including all inpatients, acute coronary syndrome, angina pectoris and heart failure, at the Division of Cardiology at FUNH in 2018, 2019 and 2020. * $p < 0.05$ vs. all inpatients in 2020.

Figure 8B shows the number of inpatients in 2018, 2019 and 2020 in the Division of Cardiology of FUNH. The number of hospitalized patients over the past three years showed a slight decrease in acute coronary syndrome, no change in angina pectoris and a marked increase in heart failure. As shown in the forecast for the Fukuoka city area (Figure 4B), the number of inpatients with each cardiovascular disease increases toward 2040. Based on the number of inpatients in FUNH in 2020 and the forecast of the number of inpatients in Fukuoka city area for angina pectoris and heart failure, we calculated and predicted the number of inpatients at FUNH for each cardiovascular disease in 2030 and 2040 according to the growth rate as shown in Figure 4B. According to the calculation, the number of patients with angina pectoris increases to 301 per year in 2030 and to 331 per year in 2040. Interestingly, the number of patients with heart failure is expected to grow significantly from 198 per year in 2020 to 271 and 336 per year in 2030 and 2040, respectively. At the Division of Cardiology in FUNH, the average ages of all patients and patients with acute coronary syndrome and angina pectoris remained almost the same for the years 2018–2020; in 2020, they were 75.7 ± 14.0 years, 72.6 ± 12.0 years and 71.5 ± 10.7 years, respectively (Figure 8C). However, the average age of heart failure patients was significantly high: 83.2 ± 9.7 years in 2020.

3.8. Changes in the Number of Hospitalized Patients with Acute Coronary Syndrome, Angina Pectoris and Heart Failure by Age and Gender in 2018, 2019 and 2020 and the Estimated Number of Inpatients Aged 75+ with Heart Failure in 2030 and 2040 at the Division of Cardiology at FUNH

The number of hospitalized patients with acute coronary syndrome decreased slightly for the age groups 15–64 and 65–74 and remained unchanged for ages of 75+ at the Division of Cardiology at FUNH (Figure 9A). For angina pectoris, it increased slightly in the age group 15–64 and increased in the age group 65–74 in 2019 but did not change much and decreased slightly in the age group 75+. Heart failure decreased slightly at ages 15–64 and increased slightly at ages 65–74 but increased significantly at ages 75+.

As shown in the forecast of inpatients in the Fukuoka city area (Figure 4B), the number of patients aged 75+ with heart failure increases toward 2040. Based on the number of inpatients in FUNH in 2020 and the forecast for inpatients in the Fukuoka city area for heart failure, we calculated and predicted the number of patients aged 75+ with heart failure in 2030 and 2040 according to the growth rate. According to the calculation, the number of patients aged 75+ with heart failure will increase to 229 per year in 2030 and to 289 per year in 2040.

Among inpatients with acute coronary syndrome and angina pectoris, the proportion of males was 60 to 70%. However, among those with heart failure, the proportion of females was slightly higher than that of males (Figure 9B).

3.9. Changes in the Number of Examinations and Treatments at the Division of Cardiology at FUNH for the Past 3 Years

Figure 9C shows the number of examinations and treatments in the Division of Cardiology at FUNH in 2018, 2019, and 2020. The average number of patients who underwent cardiac catheterization was about 400 per year, of whom about 160 were percutaneous coronary intervention (PCI) and 30 were catheter ablation as arrhythmia treatment. The number of pacemaker implantations significantly increased in 2020.

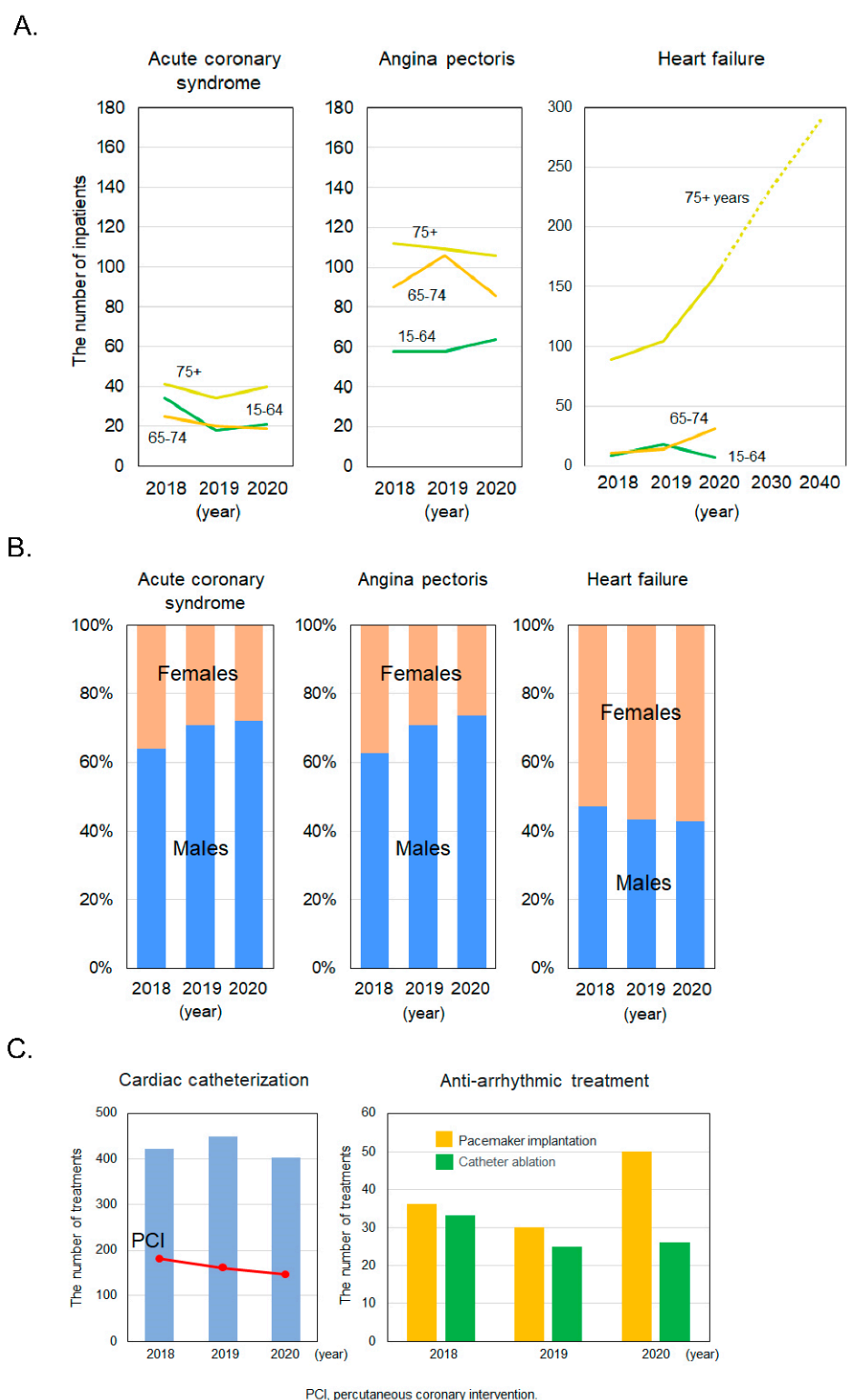


Figure 9. (A) Number of inpatients with acute coronary syndrome, angina pectoris and heart failure aged 15–64, 65–74 and 75+ and the estimated number of inpatients aged 75+ with heart failure in 2030 and 2040; (B) Gender differences among inpatients with acute coronary syndrome, angina pectoris and heart failure; and (C) Number of treatments at the Division of Cardiology at FUNH in 2018, 2019 and 2020.

3.10. Working Conditions for Medical Doctors at FUNH

When medical doctors work for 28 h in a row, they should have 9 h off. In 2020, doctors worked only 14.8 h of overtime a month at FUNH.

3.11. Countermeasures for COVID-19 Infection

FUNH accepts patients who are suspected of having a new coronavirus infection as outpatients and inpatients and conducts screening by various tests, including PCR tests. For hospitalization, a zoning area was set up with up to three dedicated beds, and the occupancy rate was about 90%.

3.12. Results of a SWOT Analysis of the Current Situation at FUNH

Table 2 shows the results of a SWOT analysis. Strengths (S) are that it is a community-based hospital, with growing income from the cardiovascular field and an established internal medicine emergency system that can provide enhanced endoscopic capabilities, cardiac rehabilitation and measures against new coronavirus infection. Weaknesses (W) include a decreased rate of bed utilization, poor cooperation between physicians and/or medical staff, increased medical material costs and drug costs, old facilities and medical equipment and working on an appropriate work system. Opportunities (O) include an increase in elderly patients, increasing cardiovascular, gastrointestinal and respiratory diseases, increasing community comprehensive care beds and creating a center for multi-disciplinary collaboration. Threats (T) include the existence of competing hospitals and the outbreak of coronavirus infection, securing medical staff and soaring salaries and changing the work habits of physicians.

3.13. Results of a Cross SWOT Analysis of the Future Direction of FUNH

Based on the results of a SWOT analysis, we considered four strategies, i.e., an offensive strategy (SO), a confrontation strategy (ST), a strengthening strategy (WO) and a defense strategy (WT), by a cross SWOT analysis (Table 2).

3.13.1. Offensive Strategy (SO)

An offensive strategy seeks to promote the growth and development of a positive factor. To influence the sustainable balance between the interests of hospital management and the interests of patients in FUNH, we should plan to become a more community-based hospital by increasing our capacity for the treatment of elderly inpatients and outpatients with cardiovascular, gastrointestinal and respiratory diseases. The hospital will also establish community comprehensive care beds and patient services through marketing because of the expected increase in the number of elderly patients.

3.13.2. Confrontation Strategy (ST)

A confrontation strategy arises at the intersection of strengths and threats. With regard to diseases, we first target cardiovascular diseases, which are expected to increase the number of hospitalized patients by 2040 (Figures 4 and 8). Next, there are many cases of gastrointestinal diseases and respiratory diseases (Figure 4A). Since these diseases are within the scope of specialized medical care in FUNH, to differentiate it from other hospitals, we opened a cardiovascular-rhythm center and a gastrointestinal endoscopy center in April 2021. A more useful cardiovascular and internal medicine emergency system and specialized cardiac rehabilitation from the acute to the maintenance phase of care are also needed. In addition, we have to establish a strategy for addressing new coronavirus infection.

3.13.3. Strengthening Strategy (WO)

A strengthening strategy arises when a weakness of a hospital is reinforced by the chance of an opportunity occurring. The rate of bed utilization may be increased due to an increase in (elderly) patients with cardiovascular, gastrointestinal and respiratory

diseases, as mentioned before regarding the offensive strategy, and to an increase in the number of community comprehensive care beds. FUNH should engage in close cooperation between physicians and medical staff by opening a center for multidisciplinary collaboration. Reduced medical material and drug costs are also required.

Table 2. Results of a SWOT analysis of the current situation and a cross SWOT analysis of the future direction of FUNH.

Internal factors				
S (Strengths)	W (Weaknesses)			
S1. A community-based hospital S2. Growing income from the cardiovascular field (heart failure in particular) S3. An established internal medicine emergency system S4. Enhanced endoscopic capabilities S5. Enhanced cardiac rehabilitation S6. Measures against new coronavirus infection	W1. A decreased rate of bed utilization W2. Poor cooperation between physicians and/or medical staff W3. Increased medical material costs and drug costs W4. Old facilities and medical equipment W5. Working on an appropriate work system			
Offensive strategy (SO) S1 · S3 & O1-O5 Aiming to establish more community-based and emergency system, community comprehensive care beds and improve patient services through marketing activities. S2 · S5 & O1-O4 Increasing the number patients (elderly) with cardiovascular, gastrointestinal and respiratory diseases.	Strengthening strategy (WO) W1 & O1-O5 Improvement of rate of bed utilization by increasing the number of community comprehensive care beds. W2 & O6 Engage in close cooperation between physicians and medical staff by opening a center for multidisciplinary collaboration. W3 & O2-O4 Reduce medical material and drug costs.	O1. An increase in elderly patients O2. An increased in cardiovascular diseases (heart failure in particular) O3. An increased in gastrointestinal diseases O4. An increased in respiratory diseases O5. An increased in community comprehensive care beds O6. Creating a center for multidisciplinary collaboration	O (Opportunities)	External factors
Confrontation strategy (ST) S2-S5 & T1 Opening cardiovascular-rhythm center and endoscopy center. Specialized cardiac rehabilitation from acute to maintenance phase of care. Recruiting patients with gastrointestinal diseases that require endoscopy. More useful cardiovascular and internal medicine emergency system S6 & T2 Establishment of strategy for addressing new coronavirus infection.	Defense strategy (WT) W4 & T1 As strategy against the presence of competing hospital, the future direction should need to be relocation and rebuilding to be strongly competitive with other hospitals. W5 & T3 · T4 Establishment of an appropriate work system for staff.	T1. Existence of competing hospitals T2. Outbreak of coronavirus infection T3. Securing medical staff and soaring salaries T4. Changing the work habits of physicians	T (Threats)	

3.13.4. Defense Strategy (WT)

A defense strategy aims to minimize losses and negative impacts that can be caused by weaknesses and threats. The most critical problem at FUNH is that old facilities and medical equipment, etc., are significantly deteriorated. In addition, as a strategy to address the presence of competing hospitals, the future direction should include relocation and rebuilding to be strongly competitive with other hospitals. In addition, various innovations need to progress to establish an appropriate working system for staff.

4. Discussion

FUNH is a medium-sized hospital that operates 117 beds. We performed a SWOT analysis of the current situation. The importance of the sustainable management of innovation approaches has been reported in small and medium-sized hospitals [10]. Based on the results of the SWOT analysis, we considered four strategies (SO, ST, WO and WT) (Table 2). Future sustainable medical management should focus on predicting and understanding the

various environmental changes surrounding future medical care, effectively and efficiently using the resources of the hospital and creating a new model for the hospital without being bound by a conventional model [17]. A Cross SWOT analysis may be a very useful tool for the future sustainable management of hospitals using internal and external environmental data. Based on the results, we discuss the usefulness of each of the four strategies for sustainable hospital management.

4.1. A Cross SWOT Analysis

4.1.1. Offensive Strategy (SO)

We seek to become a more community-based hospital by planning for the expected increase in the number of elderly inpatients and outpatients with cardiovascular, gastrointestinal and respiratory diseases. Sawara Ward, where FUNH is located, has a significantly low number of beds per 1000 people in the Fukuoka-Itoshima secondary medical area (Figure 1C). If we consider the population forecasts for Sawara Ward, which is part of the medical area of the hospital, along with those for Nishi Ward, Jonan Ward, Chuo Ward and Itoshima City, the population aged 75 and over will increase until at least 2045, so these patients will continue to visit the hospital. If patients can be guided to the hospital, the demand for beds will be satisfied. The hospital will surely recruit patients in the nearby area and further strengthen the acquisition of patients in the area around Sawara Ward, such as in Chuo Ward, Nishi Ward and Jonan Ward. Patients aged 75 and over often have complicated frailty syndromes along with various medical diseases. In 2021, 16 new community-based comprehensive care beds were established at the hospital to promote treatment using rehabilitation and to improve the rate of return to home. In fact, according to a survey on inpatient medical care, the number of hospitals with a policy of establishing new community-based comprehensive care beds and the number of beds are both increasing [18]. Thus, we must develop medical care targeting people aged 75 and over, particularly those with heart failure (Figures 8B and 9A). Furthermore, we will strengthen close cooperation with medical institutions in the western part of Fukuoka such as Sawara Ward, Nishi Ward, Jonan Ward, Chuo Ward and Itoshima City, Fukuoka City or Itoshima City Emergency Center and emergency personnel in charge of emergency transportation. In particular, with regard to cardiovascular diseases, this corresponds to acute medical care. Until now, the regional medical cooperation center in FUNH has been systematized with a focus on logistic support when patients are discharged from the hospital. Next, the hospital needs to build a system that can strengthen the acquisition of patients as forward support.

According to the Fukuoka Prefecture Community Medical Care Initiative, issues and countermeasures in the Fukuoka-Itoshima medical area are based on the voluntary efforts of medical institutions to address the shortage of convalescent beds by the conversion of acute or chronic beds. FUNH is working to achieve this and will also promote the construction of a system for providing home medical care, etc., according to the actual situation in the Fukuoka-Itoshima area [19]. One of the pillars of innovation of the hospital is the conversion from acute care beds to community-based comprehensive care beds while maintaining emergency medical care for cardiovascular diseases and contributing to the construction of a system for providing home medical care. It is also important to train medical doctors who practice community medicine [20].

The hospital should establish patient services through marketing activities. For the benefit of patients, it is important to clearly distinguish between superficial services and essential services [21]. Economists have also pointed out the importance of marketing [22]. As with other service industries, medical care is in an era in which hospitals are selected by patients according to the service content. Wada discussed the ideal medical management in an aging society [23]. Patients have high expectations for the medical practice itself, which is likely to be a dissatisfaction factor. For patients, the “appropriateness of doctor’s diagnosis and treatment” is also important, but “easy to understand doctor’s explanation” was more important than what doctors had thought. On the other hand, surface services other than medical practice have low expectations and are likely to be a factor of satisfaction.

For patients in their 60s and above, “shortening waiting time”, “consideration for privacy” and “convenience of parking lot” were likely to be satisfaction factors. While such patient surveys were not conducted in this study, in the future, it will be necessary to identify benefits to patients through questionnaire surveys.

4.1.2. Confrontation Strategy (ST)

First, a core competency of FUNH is cardiovascular diseases. We opened a cardiovascular-rhythm center in April 2021. More than 90% of patients with ischemic heart diseases such as acute myocardial infarction and angina are entirely treated in the Fukuoka-Itoshima medical area, and patients in the Kasuya area and Chikushi area also travel to the Fukuoka-Itoshima area (Figure 1A). In addition, “medical treatment management,” “treatment and surgery,” “imaging diagnosis” and “rehabilitation” related to ischemic heart disease are also being implemented in the hospital. Furthermore, in terms of accessibility in hospitals participating in the Diagnosis Procedure Combination (DPC) system [24] for acute myocardial infarction, 95.1% of the residents had access within 30 min. Therefore, medical care for ischemic heart disease in the Fukuoka-Itoshima medical area is in competition with care provided at hospitals in the medical area participating in the DPC system. As mentioned above, the number of patients in the Fukuoka-Itoshima medical area will continue to increase. Therefore, we will build a unique system that can handle all patients, including those with ischemic heart disease, from acute care to maintenance, those who have worsened to heart failure and those who desire home medical care due to heart failure. This could lead to the acquisition of patients and also be beneficial for patients.

Patients aged 75 and over often suffer from several illnesses and are provided medical care under the governance of the director of the Department of Internal Medicine. In the future, we will formulate a strategy centered on the treatment of cardiovascular diseases, for which the number of inpatients is expected to increase significantly (Figure 8B). In the future, we will further increase the weight of cardiovascular diseases centered on cardiovascular and rhythm centers and raise the medical income from cardiovascular diseases from 45% of the total in 2020 to 60 to 70%. This is the ultimate goal. A study examined the strategy of medium-sized urban hospitals using the cardiovascular area of three hospitals as an example [25]. According to that report, the share of medical income from cardiovascular diseases in each hospital, which had 17 to 22 clinical departments, was 20.5%, 8.9% and 11.3%, while FUNH does not have this many clinical departments. These three hospitals also tended to segregate their areas of expertise in the cardiovascular field. Therefore, unlike these hospitals, to increase the share of medical income from cardiovascular diseases in the hospital, we should not be limited to one field in the various cardiovascular fields and should instead respond regardless of whether the patient is in the acute phase, chronic phase or maintenance phase of care. It is also important to specialize in cardiac rehabilitation, since comprehensive cardiac rehabilitation for both inpatients and outpatients is potentially cost-effective as determined using a quality-adjusted life year as an evaluation index [26,27]. In addition, the incremental cost-utility ratio of each data source of cardiac rehabilitation was dominant or effective.

The number of inpatients at FUNH due to heart failure is already increasing significantly and will increase even further in the future (Figures 8B and 9A). The 5-year survival rate of heart failure is less than 50% [28]. In addition, the number of Japanese outpatients with heart failure is predicted to increase gradually as the population ages, reaching 1.3 million by 2030 [29]. As a strategy to address this dramatic increase in heart failure patients due to the aging population, we may implement home-based rehabilitation and palliative medicine for heart failure. Home-based training with telemonitoring guidance can be used as an alternative to center-based training for low-to-moderate cardiac risk patients entering cardiac rehabilitation [30]. To approach potential patients with heart failure, we will seek cooperation with the community through public lectures and visits to public halls. FUNH will build a wide-area heart failure cooperation path including other medical institutions together with the hospital. Furthermore, we must seek to become

a hospital that specializes in heart failure with a high return-to-home rate. We need to establish a system in which patients are in the hospital for the purpose of education regarding heart failure. In addition, we will assign several arrhythmia specialists to increase sales by increasing the number of highly profitable pacemaker placements and catheter ablations. At the same time, we will seek to generate profits by taking measures such as reducing medical material costs. In the Second Five-Year Plan for Stroke and Overcoming Cardiovascular Disease announced in March 2021, the Cardiovascular Center/Aortic Emergency Center Hospital concept is one of the major pillars [31]. The Primary Cardiovascular Center accepts patients with emergency cardiovascular diseases such as acute myocardial infarction 24 h a day and performs primary coronary angioplasty. Furthermore, patients should be transported to the secondary cardiovascular center as needed and should be in a system to carry out comprehensive rehabilitation from the acute stage. In the future, it may be possible for FUNH to call itself a Primary Cardiovascular Center. The Cardiovascular and Rhythm Center must become a system that can handle patients with cardiovascular disease at all stages, from acute highly specialized medical care specializing in cardiovascular disease to the convalescent, maintenance phase including home-based medical care and palliative medicine.

FUNH needs to develop strategies against new coronavirus infection. The hospital has a system in place to accept referrals from local residents, local medical institutions, elderly health facilities and long-term care facilities without delay. Furthermore, the hospital actively accepts patients who have recovered from the new coronavirus infection but cannot return home due to other complications or frailty. The latest survey results of the “Survey on Hospital Management Situation Due to the Spread of Coronavirus Infection” were published in February 2021 (for the third quarter of 2020) [32]. Compared to the same period of the previous year, the numbers of outpatients and inpatients continued to decrease, and medical practice revenue decreased by 5.1% compared to that for the previous year for hospitals with coronavirus infection patients and by 2.1% for hospitals that did not accept these patients. With regard to support funds, when medical practice revenue was compared to that for the previous year, there was a decrease of 1.0% in hospitals that accepted patients with coronavirus infection and of 1.4% in hospitals that did not accept these patients. Most of the hospitals achieved almost the same level of medical practice profits as in the previous year thanks to subsidies. FUNH accepted patients who were suspected of having a new coronavirus infection as outpatients and inpatients. However, the conditions for becoming a priority medical institution for patients with coronavirus infection were not met. In the revision of medical treatment fees in 2021, which will bring to light the issues of the medical treatment provision system due to the spread of the coronavirus epidemic, it should be considered that “there is no revision of medical treatment fees without reform of the medical treatment provision system” [33]. Therefore, it is important to develop a reliable post-coronavirus infection-era hospital innovation policy. It is important that old FUNH be transformed into a hospital that functions to prepare for further as-yet-unknown infectious diseases.

4.1.3. Strengthening Strategy (WO)

FUNH will take measures to develop medical care centered on cardiovascular diseases targeting the elderly. However, it is extremely difficult to increase the occupancy rate to 90% or higher simply by accepting patients in the acute phase of cardiovascular disease, and the number of acute-phase general beds must decrease from 117 to about 85 beds [$117 \text{ beds} \times 65\%$ (the current occupancy rate of beds)/ 90% (the target occupancy rate of beds)] in FUNH. The hospital aims to improve its bed occupancy rate by enhancing cooperation as a rehabilitation support hospital after the highly acute phase (post-acute), and by accepting emergency hospitalization (sub-acute) for residents of elderly health facilities. The number of patients aged 75 and over is increasing (Figures 3 and 4) and this population is complicated with frailty syndrome along with various other medical conditions. In 2021, 16 beds were newly established for use in community-based comprehensive care to

reduce the number of acute-phase general beds. We must promote treatment that seeks to rehabilitate internal disorders. Aiming to improve the return-to-home rate is also beneficial for patients. However, we, as part of a medical team that includes the patient's family, doctors and nurses, must reach a consensus on returning home. In small and medium-sized hospitals, there is a lack of consensus on treatment between doctors and nurses, and there are situations in which nurses do not agree with the patient's family when considering care and treatment that may be good for the patient [34]. As part of this effort, we will implement the above-mentioned changes in bed functions (16 beds for community-based comprehensive care), support discharge from hospitals and strengthen cooperation with home-visit medical institutions.

As a measure to increase the bed occupancy rate, we may increase the number of community-based comprehensive care beds to 32 beds (117–85 beds), aiming for stable profits. On the other hand, 85 beds in the general acute phase will be fully rotated to improve profitability and operate with a utilization rate of 90% or higher, as mentioned before. Furthermore, at the time of planning a new hospital in the future, the profit from the expansion of convalescent rehabilitation beds will be used as a target for frail patients with and without heart failure who are 75 years old or older and have complications of various medical conditions. In fact, older patients who are frail or prefrail who were hospitalized for acute decompensated heart failure received progressive rehabilitation intervention that resulted in greater improvement in physical function [35]. We must also keep in mind measures to increase profitability by establishing new convalescent rehabilitation beds. Alternatively, FUNH may consider converting from a medium-sized hospital to a small-sized hospital in order to maintain a utilization rate of 90% or higher. In that case, we may be able to establish a cardiovascular patient-centered hospital with 64 beds for the general acute phase and 16 beds for community-based comprehensive care, accompanied by a reduction in medical stuff and various equipment.

In general, for acute care beds, the average length of stay is often an issue. According to the "Integrated Social Security and Tax Reform Plan" [36] published in 2011, by 2025, the average length of stay will be about 16 days in the severe acute phase, about 9 days in the general acute phase and about 60 days in the recovery phase. At present, as an acute care hospital, FUNH has an average length of stay of about 11 days (Figure 8A). Therefore, if long-term hospitalization or rehabilitation is required depending on the patient's condition, community-based comprehensive care beds will be used without taking measures to extend the length of stay in general beds and increase the occupancy rate.

FUNH promotes the concept of creating a center for multidisciplinary collaboration. In 2021, the conventional centering of clinical departments and separate organizations was abolished because each clinical department was further subdivided according to its specialty, and this led to poor cooperation between medical doctors and/or medical staff. On the other hand, cross-functional departments involving all staff, which are indispensable for patient-centered team medical care through multidisciplinary collaboration, will promote centering. As a university hospital, establishing an education system for medical staff, striving to improve technology, and creating an attractive system will lead to stable employment and subsequently produce stable income. The existing Medical Safety and Infection Center was reorganized, and the Medical Technology Department became the Medical Technology Center. In addition, the division of Infection from Medical Safety and Management Center will be made independent, and the Infection and Education and Research Center will be newly established to implement measures focused on creating a comfortable work environment, mutual cooperation between medical staff and technical improvement. In addition, in the training of doctors, we will promote the application of students certified as internal medicine majors. FU has a School of Medicine, a School of Nursing and a Faculty of Pharmaceutical Sciences. FUNH will continue to contribute to the practical education of these students as a hospital attached to the Faculty of Medicine.

FUNH is an internal medicine hospital, and we have to especially develop our capabilities in the cardiovascular field (Figures 8 and 9). Efforts are also needed to reduce medical

costs because many therapeutic strategies in the cardiovascular field require the use of expensive catheters and devices. For this purpose, first, the same Supply Processing and Distribution system as that used at both FU Hospital and FU Chikushi Hospital should be introduced to reduce costs. Second, the three hospitals at FU should work together to reduce medical material costs, such as by negotiating together to reduce the costs of medical consumables. Third, we should introduce the Facility Management Service for sample inspection costs and to collectively handle outsourced inspections, analyzers, consumables, etc. This should help reduce costs with the developing cardiovascular field. With respect to pharmaceuticals, care should be taken in the interests of hospitals, such as polypharmacy and formulary [37]. In addition, since the medical information system and software at the hospital are aging, which reduces the productivity of the medical staff, these assets must remain functional and need to renew.

4.1.4. Defense Strategy (WT)

As a strategy to counter the presence of competing hospitals, the future direction for the hospital should include relocation and reconstruction. Based on an examination of the hospital, the facilities, medical equipment, etc., are significantly deteriorated, and large expenditures are required every year for maintenance. The hospital also spends a large amount of money to lease the land it occupies. There are four proposals, each of which is associated with its own problems: (1) local rebuilding: Prolonged construction period, high construction cost, land lease problem; (2) continuation with repair of current hospital: high repair cost, obsolete building, limit of hospital function, problems with leased land; (3) relocation and reconstruction: examination of reconstruction location, reconstruction cost; and (4) closing the hospital; however, if the hospital closes, patients who visit our hospital (in 2019, the total number of hospitalized patients, the number of outpatients and the number of patients who underwent a medical examination were 26,314, 20,716 and 5739, respectively) and about 200 staff members will have problems. We believe that reconstruction with relocation is the best strategy due to the sustainable developmental innovation of the above-mentioned efforts. We should have a project that includes the strategies of specializing in cardiovascular medical care, community-based comprehensive care and preparing equipment such as a catheter room for new unknown infectious diseases. If this is the case, most of the patients who come to FUNH may be from Sawara Ward in the western part of Fukuoka, while almost the same numbers will come from Nishi Ward, Jonan Ward and Chuo Ward. Therefore, the candidate site for the new hospital should be in Sawara Ward or Chuo Ward, within 1–2 km from the current location.

Currently, FUNH is working on an appropriate work system at the Department of Internal Medicine that will address the work habits of doctors and will come into effect in 2024 [38]. This should help limit overtime work by doctors and reduce labor costs. Furthermore, the hospital is actively working to reduce the burden on doctors by optimizing the number of shifts and clearing the restrictions on continuous working hours after shifts. In addition, the hospital has introduced an incentive system regarding doctors' work, such as the payment of waiting fees and overtime allowances to on-call doctors, and allowances for accepting overtime emergency inpatients. FUNH plans to maintain this system while it is re-evaluated in the near future. In addition, to reduce the workload of doctors, the hospital will work to shift tasks to other staff members.

4.2. Future Perspective

In the Fukuoka-Itoshima medical area where FUNH is located, the total population will decrease in the future, whereas the population aged 65 and over will increase. In addition, the number of patients with cardiovascular disease (especially heart failure) is expected to increase significantly (Figure 10). According to the offensive, confrontation, strengthening and defense strategies, the future direction for the hospital should include plans for relocation and reconstruction considering the sustainable balance between income and expenses. If the four strategies described above can be successfully adopted, hospital

profits will be increased by realizing management innovation in a community-based hospital that can provide advanced medical care, while specializing in medical care that considers the profit balance between hospital management and the interests of patients. Even if the hospital relocates and rebuilds in the future, we can still seek to carry out sustainable hospital management over a long period of time. Simultaneously, we can achieve developmental innovations. In the New Normal era, new hospitals must aim to be able to respond quickly to new infectious diseases and unpredictable disasters and utilize artificial intelligence. New hospitals seek to support the local population through 100 years of life.

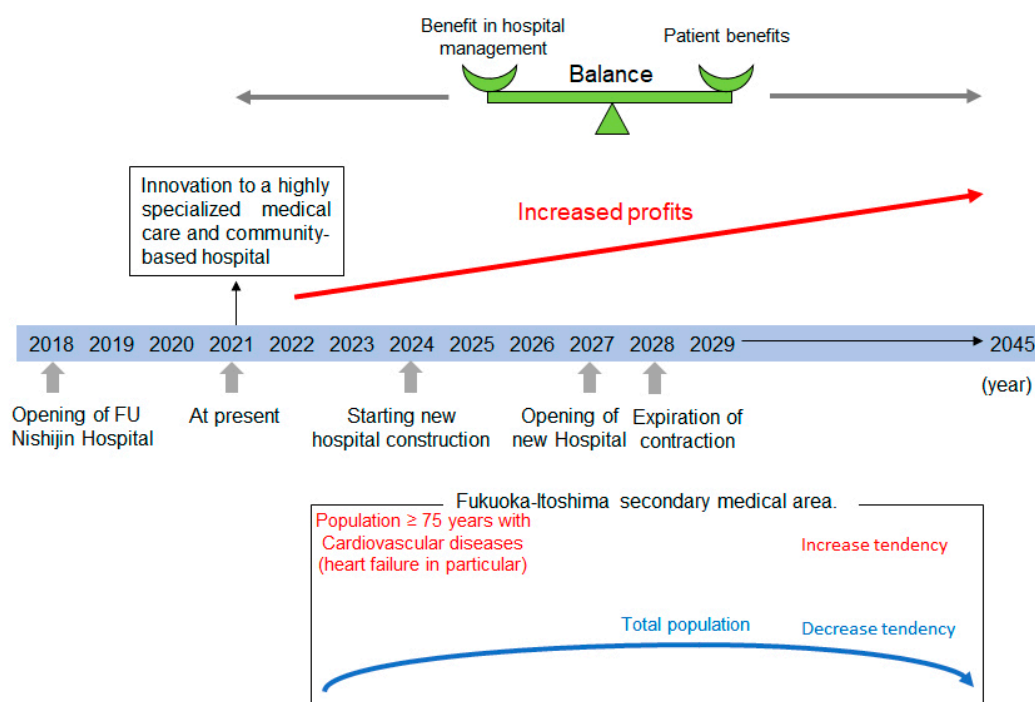


Figure 10. Future direction of FUNH.

4.3. Study Limitations

There are several limitations in this study. First, the results of the statistical analyses were not sufficiently significant. Second, we did not consider data from the predecessor hospital. Third, we analyzed the data of hospitals around FUNH but did not consider them much in the discussion.

5. Conclusions

We performed a cross SWOT analysis with offensive, confrontation, strengthening and defense strategies. This analysis is a very useful tool for planning the future direction of hospitals using internal and external environmental data, and FUNH will eventually be able to achieve sustainable developmental innovations by rebuilding while working on various measures.

Author Contributions: Conceptualization, S.-i.M.; methodology, S.-i.M. and D.N.; validation, S.-i.M., D.N. and K.S.; formal analysis, H.S. and S.-i.M.; investigation, K.K. and H.S.; data curation, K.K. and H.S.; writing—original draft preparation, S.-i.M., D.N. and S.I.; writing—review and editing, S.-i.M.; supervision, K.S.; project administration, S.I. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: The data that support the findings of this study are available from the corresponding author upon reasonable request.

Acknowledgments: We thank all of the staff members of Fukuoka University Nishijin Hospital.

Conflicts of Interest: The authors declare that there are no conflict of interest.

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