

Original article

A Report on 27 Cases of Nursing and Health-Care Associated Pneumonia (NHCAP) at a Geriatric Health Services Facility in northeastern Japan

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Abstract

Background: Cases of “Nursing and Health-Care Associated Pneumonia,” which is proliferating with an alarmingly high pace in Japan, have come to be designated with the abbreviation of NHCAP.¹⁾ A rapid upsurge in the number of the elderly aged 65 or over took place in Japan with baby-boomers born in the immediate aftermath of World War II as a result of the return of Japanese soldiers from foreign battlefields as well as those of their preceding generation having joined the ranks of retirees over the past two decades.

A growing percentage of Japanese families have come to entrust the natural duty of caring for their frail elderly parents to geriatric nursing-care health care facilities by taking advantage of the government-managed nursing care insurance system, in addition to paying moderate monthly fees to cover food, diaper and other necessary miscellaneous expenses monthly to such facilities, to avoid taking care of them at home by themselves. This has come to cause NHCAP to draw increasingly strong attention among medical professionals, families, mass media, bureaucrats in charge of health care and welfare services for the Japanese populace, while generating the pressing need for the doctors and other members of Japanese society to handle the tsunami-like swelling of NHCAP cases properly. The situation has also highlighted the necessity of analyzing the situation objectively by examining the reality of NHCAP cases and considering their appropriate handling at facilities and hospitals correctly.

Objectives: This report’s purpose is to provide accurate accounts of the clinical courses followed by twenty-seven NHCAP patients whose nursing care were handled at the Roken Towada, a geriatric health services facility in Towada City, Aomori Prefecture, in the northern tip of the Honshu main island of the Japanese archipelago.

All the 27 patients died eventually after they were transferred to nearby hospitals after their health conditions deteriorated to certain levels requiring such transfers in view of the nation’s legal requirements that essentially mandate that such patients be transferred from geriatric health-care facilities to hospitals once their resident-patients at geriatric nursing-care facilities enter the closing phase of their lives at which their conditions have seriously deteriorated to levels that the facilities’ doctors have judged “are hard to treat” on the basis of their medical skills and medical equipment available at such geriatric nursing-care facilities.

The 27 cases have been classified here into two groups for analytical purposes. One group of patients is those to whom food (any type of food ranging from liquid-state foods to ordinary solid food) had been given orally until they entered the last day of their lives at Roken Towada, with the other being the group of patients to whom nutrition were given via a gastric or other types of medical tubes or through the Total Parenteral Nutrition (TPN) supply tube inserted into her superior vena cava from her subclavian vein below her Clavicle for a substantial duration of time.

Patients and Methods: We analyzed retrospectively a total of twenty-seven NHCAP cases at our geriatric nursing-care facility in the period between 2012 and 2018. All the 27 cases had eventually fatal outcomes, although they died following their transfers to hospitals at the closing serious phase of their lives. Out of the 27 cases, 19 cases were those of patients to whom food (any types food from liquid food to ordinary solid food) had been orally given until the last day of their lives at Roken Towada, with the remaining 8 cases are those of patients who were given nutrition with various artificial methods such as the percutaneous endoscopic gastrostomy (PEG) and the TPN supply method involving the insertion of a tube into the superior vena cava through the subclavian vessel.

Of the eight cases, 3 persons were fed via a gastrostomy tube (Two of the three, assigned the case numbers 17 (T.N.) and 23 (S.K) in this paper, were admitted to Roken Towada after being installed with a PEG at medical or nursing-care institutions other than Roken Towada and spending some time at those facilities. The third patient, who was assigned the case number 10 (KK.) here, was transferred to a hospital after developing NHCAP following only one and a half month of stay at Roken Towada. But the case number 10 (K.K.) was returned to Roken Towada after spending a certain period at the hospital and with a PEG installed there). Case number 20 (K.N) is that of a patient on whom an intestinal fistula tube was inserted (This person had been originally admitted to Roken Towada in the state of carrying a PEG). Three other cases i.e., case numbers 19(M.F), 24(C.S.), 27(S.Y) are those of patients fitted with a nasal tube with the other case, that is case number 21(A.S) is that of a patient who received a surgery to enable her to receive nutrition via a total parenteral nutrition (TPN) method five months after she was discharged from Roken Towada.

Results: The study showed that NHCAP patients who received nutrition either via a tube feeding or TPN methods lived for much longer a period than those who had been orally fed until the last day of their lives at Roken Towada. The varying duration of time that passed between the patients' first contraction of pulmonary infections and their eventual deaths at the two groups were compared by drawing their survival rate curves. A 50% survival rate at the group of orally fed patients was registered at an average 11.5 months after their admission to Roken Towada, whereas the same survival rate was logged at the group of patients who received nutrition either via a tube feeding or TPN methods was logged at an average 30.5 months from the days of their admissions to Roken Towada. At the oral feeding group, the patient who lived longest was alive for 48 months, while at the tube feeding/TPN group, the corresponding figure was 71 months.

In view of the data collected and carefully considered, we have concluded that at patients who contracted NHCAP during their Roken Towada stay or at the final phase of their stay at Roken Towada, patients at the tube feeding/TPN group lived much longer than their peers at the orally fed group. From their first episode of contracting an NHCAP to their eventual deaths, all those patients experienced severe and long-lasting pulmonary infections repeatedly, disregards of whether they were treated during the final phase of their lives at our nursing-care institution or hospitals to which they were transferred. Quality of life at all these patients were low.

Introduction

The presence of a gigantic group of the elderly aged over 65 year in terms of their percentage to the total population has never been observed in Japan as well as in any other country in the history of the world. Hence, little is known about the details of the clinical course of NHCAP cases at human beings aged ≥ 65 years. This report's purpose is to provide accurate accounts of the full course of clinical manifestations at NHCAP cases at such people over 65 years, and how the adoption of artificial nutrition methods like a PEG modified the course of clinical manifestations at patients who received such treatments.

Place of study and Methods of analysis

Geriatric health services facility (Roken)

The Japanese word “Roken” is an abbreviation that stands for a “Kaigo Rojin Hoken Shisetsu.” The longer formal name of such facilities is literally translated as “The Elderly’s Residential Facility that Provides Nursing-Care and Health Maintenance Services.” The name suggests that the facility provides the elderly with a wide range of health services whose scope encompasses both medical and nursing-care services areas. Although Rokens are supervised by a doctor who works as its director on a full-time basis, the Rokens are not authorized to invoke the government-managed national health insurance system for medical services they provided. In this sense, a Roken is a unique facility institutionalized by the government to provide the elderly with as high-quality medical services as possible, while seeking to limit government expenditures relating to national health costs in view of a rapidly growing percentage of the elderly in relation to the nation’s total population which would put unbearable financial strains on the national treasury due to such seniority-associated debilitated people’s tendency to develop a range of serious diseases if they were treated only in hospitals with the legal authority to invoke the national health insurance system which thereby tend to demand government payments for whatever high-cost medical services they provided without transferring them to geriatric nursing-care facilities.

In this connection, it is important to note that laws do not obligate the government to pay for medical services which a Roken may provide -- such as medicines, intravenous drips, diagnostic services and vital nursing-care services like the removal of foreign material like food particles from patients’ laryngopharynx, oropharynx and parapharyngeal space with a suction catheter called the Nelaton catheter -- from its national health insurance system account.

Still, a Roken provides better medical and nursing-care services than most other types of nursing-care facilities for the elderly, because relevant laws and the health ministry’s ordinances both require and authorize a Roken to hire and have a doctor stationed at the venue or have a doctor supervise its staffer by giving appropriate medical instructions, thereby freeing a Roken from the

complications of having to transport its old resident-patients to nearby hospitals to seek medical treatments whenever their health conditions deteriorate seriously.

But as explained in the preceding paragraphs, a Roken has a demerit of its own, in that the same laws and ordinances do not authorize it to ask the government to pay for medical services it provided to its old resident-patients by invoking the national health insurance system, although, theoretically, the very health insurance system should provide coverage to all Japanese citizens.

As a result, a Roken is required to pay for all such medical services out of its own pocket, be the services provided medicines, intravenous drips or a removal of foreign substance like food or saliva from patients' laryngopharynx or airways with the Nelaton catheter. Even if a Roken transports patients to the out-patient sections of its nearby hospitals, the very transportation and personnel costs incurred in the transportation process are not covered by the national health insurance system, thus forcing the Roken to dig into its pocket.

Article 15 of the health ministry's ordinance -- issued on March 31, 1999 -- mandates that a doctor at a Roken examine patients, administer medicines or injections and provide medical treatments to resident-patients "in an appropriate manner" commensurate with the patients' conditions. But the same laws and ordinances do not specify what sorts of medical treatments, medicines and diagnostic procedures services Roken doctors should use and provide.

Article 16 of the same ordinance, meanwhile, stipulates that a Roken doctor "must take steps to send its resident-patients to a hospital that has been cooperating with the Roken in cases where the doctor judged that it is difficult to provide, on its own, the levels of medical services deemed necessary to handle the conditions of the residents."

Apart from the above-mentioned articles, Provision 4 of the ministry's ordinance No. 59 -- issued on March 31, 2000 -- stipulates that a Roken doctor must "provide the types of medical treatments and services which the doctor can provide" on the basis of his or her medical skills and knowledge, while stipulating that the Roken "is not authorized to ask the government to pay for the costs of

such medical services and treatments by invoking the national health insurance system.” This clause presents a serious moral problem and irritable chronic headache to Roken doctors.

Article 2 of the Nursing Care Insurance Law mandates that a Roken facility must have at least one doctor for every 100 resident-patients, while Article 15 of the 1999 ordinance issued to facilitate the law’s enforcement stipulates that such a Roken doctor must provide “appropriate medical services” with regards to resident-patients’ diseases or injuries “for which the doctor deems necessary to provide certain medical treatments on the basis of an appropriate diagnosis.”

In other words, laws authorize a Roken to have a doctor. But the same laws do not authorize the doctor to invoke the national health insurance system and ask for payments from the national coffers for the medicines which he or she may prescribe in view of the health conditions of the patients.

Roken depend almost totally on payments from the government-managed nursing-care insurance system for their revenues. As we have seen above, the Japanese government expects Roken to provide medical services – examination, diagnosis and treatments-- as far as possible from their own pockets. And it tacitly anticipates that Rokens cover expenses for their medical services as far as possible to the point of making up for any shortage of money necessary to keep resident-patients living decently with regards to their health conditions out of their pockets, given the fact that Roken expenses are not covered by the government-managed health insurance system. These legal clauses enable the government to limit expenditures for Roken patients to those that is payable from the government-managed nursing-care insurance system, thereby limiting its overall expenditures for the ailing elderly. Similarly, it tacitly anticipates that personnel and transportation expenses needed to bring patients to the out-patient sections of nearby clinics or hospitals be covered by Rokens.

The number of this category of nursing-care facility for the elderly, called a Roken, stood at 3,710 as of 2012 with the Rokens taking care of a combined 330,017 resident-patients across the nation. They provide nursing-care services and above-mentioned limited scope of medical treatments to people who have come to need nursing care following seniority-associated serious natural

deteriorations of their health conditions and seek to enable such elderly to recover to the point of returning to their homes.

Under relevant laws and ordinances, a person who wants to be admitted and be cared at a Roken are required to file an application with their local governments and to obtain a certificate of the Ministry of Health, Labor and Welfare (MHLW) which certifies that the person's health has deteriorated to one of the five health assessment grades assigned to such person based on relevant assessments by doctors hired by local governments on the basis of the grade-assessment authority entrusted to them by the MHLW.

Below, let us provide a copy of MHLW ordinances for the geriatric healthcare system that we have explained above. The copy carries the crucial Article 15. Provision 6 of the same article stipulates that Roken doctors are barred from treating their patients with any expensive medicines unless the health minister gives special permits to use such medicines that may be specified in writing issued by the ministry, in yet another apparent MHLW attempt to limit national health care costs for the elderly.

(診療の方針)

第十五条 医師の診療の方針は、次に掲げるところによるものとする。

https://www.mhlw.go.jp/web/t_doc?dataId=82999407&dataType=0&pageNo=1

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・介護老人保健施設の人員、施設及び設備並びに運営に関する基準(◆平成11年0... Page 9 of 23

- 一 診療は、一般に医師として必要性があると認められる疾病又は負傷に対して、的確な診断を基とし、療養上妥当適切に行う。
- 二 診療に当たっては、常に医学の立場を堅持して、入所者の心身の状況を観察し、要介護者の心理が健康に及ぼす影響を十分配慮して、心理的な効果をもあげることができるよう適切な指導を行う。
- 三 常に入所者の病状、心身の状況及びその置かれている環境等の的確な把握に努め、入所者又はその家族に対し、適切な指導を行う。
- 四 検査、投薬、注射、処置等は、入所者の病状に照らして妥当適切に行う。
- 五 特殊な療法又は新しい療法等については、別に厚生労働大臣が定めるもののほか行ってはならない。
- 六 別に厚生労働大臣が定める医薬品以外の医薬品を入所者に施用し、又は処方してはならない。

(平一ニ厚令一ニ七・一部改正)

(必要な医療の提供が困難な場合等の措置等)

第十六条 介護老人保健施設の医師は、入所者の病状からみて当該介護老人保健施設において自ら必要な医療を提供することが困難であると認めたときは、協力病院その他適当な病院若しくは診療所への入院のための措置を講じ、又は他の医師の対診を求める等診療について適切な措置を講じなければならない。

- 2 介護老人保健施設の医師は、不必要に入所者のために往診を求め、又は入所者を病院若しくは診療所に通院させてはならない。
- 3 介護老人保健施設の医師は、入所者のために往診を求め、又は入所者を病院若しくは診療所に通院させる場合には、当該病院又は診療所の医師又は歯科医師に対し、当該入所者の診療状況に関する情報の提供を行わなければならない。
- 4 介護老人保健施設の医師は、入所者が往診を受けた医師若しくは歯科医師又は入所者が通院した病院若しくは診療所の医師若しくは歯科医師から当該入所者の療養上必要な情報の提供を受けるものとし、その情報により適切な診療を行わなければならない。

Background of patients

We analyzed retrospectively a total of twenty-seven NHCAP cases for whom we provided nursing care and medical services during the period between 2012 and 2018. All the 27 patients died eventually at hospitals to which they had been transferred in the closing phase of their lives. (Table 1) Out of the 27, 13 were males and 14 were females. Ages at which these males died ranged from 78 to 102 years old. Twelve out of the 13 male patients lived longer than the Japanese populace's current average life expectancy for males at 80.98, while eleven of the 14 female patients lived longer than such average for females at 87.14. The ages at which patients contracted their first pneumonia ranged from 76 to 102 at males. Twelve out of the 13 male patients contracted their first pneumonia when they were older than the average life expectancy of 80.98. The ages at which the female patients contracted their first pneumonia ranged from 72 to 101.

Ten out of the 14 female patients contracted their first pneumonia when they were older than Japanese females' current average life expectancy of 87.14. Nursing and Health-Care Associated Pneumonia (NHCAP) turned out to be the disease that pounded out most of these elderly after they lived beyond these averages.

Table 1. Background of the 27 NHCAP Patients

	Male	Female
Number of Patients	13	14
(Average life expectancy)	(80.98)	(87.14)
(of the 27 cases, the following number of patients died at the age older than the average life expectancy)	(12)	(11)
Ages at which they contracted their first attack of pneumonia		
Range	76-102	72-101
Mean \pm SD	88.8 \pm 7.3	90 \pm 7.5
Ages at which the 27 died actually		
Range	78-102	74-105
Mean \pm SD	90.3 \pm 6.5	91.6 \pm 7.8

Table 2 shows span between first pneumonia and death, times of pneumonia at Roken Towada or at Hospital inbetween the backgrounds of the patients. The duration of time that passed between their first contraction of pneumonia and their deaths ranged from zero to 71 months. The number of days between the patients' discharge from Roken Towada and their deaths at hospitals ranged from zero to 450 days. Patients were admitted to hospitals and then breathed their last there. It is important to note that before the patients were admitted to Roken Towada for the last time, most of them had repeated admissions to, and discharges from, Roken Towada multiple times with the sole exception being a person who underwent such a round-trip only once. Between their periods of hospital stays, the patients used to be sent back from the hospitals to, and stayed at, Roken Towada.

Most of them experienced febrile episodes that may have stemmed from pneumonia during such long-lasting interval periods at Roken Towada that are sandwiched between their periods of hospital stays. Some patients manifested

such febrile episodes for multiple times with one of them even undergoing such febrile episodes as many as 25 times. Although a definite diagnosis could not be handed down by Roken Towada doctors because of the lack of diagnostic equipment like an X-ray imaging machine and bacteria-culture and identification equipment at the facility, the patients were treated with some types of broad-spectrum antibiotics which a Roken Towada doctor deemed appropriate to treat cases of pneumonia and other infectious diseases in view of the patients' symptoms or with intravenous drips of such antibiotics.

Table 2. Span between first pneumonia and death, Times of pneumonia at Roken Towada or at Hospital at interval ☐orally given food, ☐gastric tube/intestinal tube, ☐nasal tube, ☐total parenteral nutrition (TPN)

No.	Initial of name	Sex	Age of first pneumonia episode	Age of death	Duration between first pneumonia and death	Admission to Towada Daiichi Hospital and/or to Chuo Hospital due to pneumonia before sent to final admission, times(cumulative weeks), with discharge diagnosis of pneumonia	Pneumonia during stay at Roken Towada (duration of sick - cumulative weeks)
No.01	H.T.	F	93	93	0 M		1 time (1 day)
No.02	C.N.	F	93	93	1 M		
No.03	M.Y.	F	99	99	2 M		
No.04	M.T.	F	86	86	2 M	2 times (5W)	1 time (1 day)
No.05	S.O.	M	102	102	2 M	1 time (2W)	1 time (1 day)
No.06	Y.M.	F	81	82	3 M	1 time (3W)	2 times (2W)
No.07	K.I.	M	89	90	3 M	2 times (10W)	3 times (6W)(UTI and renal failure)
No.08	S.K.	M	97	97	8 M	2 times (7W)	
No.09	C.S.	M	84	85	11 M	3 times (4W)	
No.10	K.K.	M	93	94	12 M	5 times (6W)(combined with hyperglycemia)	
No.11	S.S.	F	89	90	13 M	2 times (3W)	
No.12	Y.M.	M	76	78	13 M	1 time (2W)	4 times (5W)
No.13	T.S.	F	97	98	17 M	2 times (4W)	8 times (12)
No.14	T.T.	F	89	91	18 M	3 times(30W)	5 times(6W)
No.15	T.O.	M	85	86	19 M	1 time(2W)	2 times (3W)
No.16	A.M.	F	86	87	19 M	4 times (7W)	
No.17	T.N.	M	93	94	20 M	14 times (20W)	
No.18	I.H.	F	89	91	21 M	3 times(3W)	1 time(2W)
No.19	M.F.	M	90	92	22 M	2 times(4W)	8 times (9W)
No.20	K.N.	F	72	74	28 M	2 times(17W)	8 times (11W)
No.21	A.S.	F	92	94	32 M	1 time (3W)	1 time (1W)
No.22	K.T.	M	86	89	37 M	1 time (no information)	
No.23	S.K.	M	83	86	39 M	4 times (17W)	1 time (5W)
No.24	C.S.	F	101	105	41 M	8 times (29W)	4 times (5W)
No.25	T.N.	M	81	84	44 M	5 times (10W)	3 times (3W)
No.26	T.W.	M	92	96	48 M	4 times (12W)	10 times (12W)
No.27	S.Y.	F	93	99	71 M	4 times(43W)	25 times (34W)

Table 3 shows physical condition when sent to a hospital for last terminal admission. All of them were transported to a hospital urgently by Roken Towada's own minivan which it usually uses to transport the elderly or by ambulance before expiring at the hospital.

Table 3. Physical condition when sent to a hospital for last terminal admission ☐ orally given food, ☐ gastric tube/intestinal tube, ☐ nasal tube, ☐ total parenteral nutrition (TPN)

No.	Initial of name	Sex	Physical condition when sent to a hospital for last terminal admission
No.01	H.T.	F	Warm shock, tachycardia, respiratory distress, cardiac failure
No.02	C.N.	F	Low body temperature, paroxysmal tachycardia, severe respiratory distress, warm shock
No.03	M.Y.	F	Severe respiratory distress SpO ₂ 76~84% under O ₂ 10L/min, bradycardia→tachycardia
No.04	M.T.	F	Low body temperature w/o raised heart rate, poor general condition
No.05	S.O.	M	Terminal febrile stage
No.06	Y.M.	F	Terminal febrile stage
No.07	K.I.	M	Terminal febrile stage, tachycardia, cardiac failure/renal failure
No.08	S.K.	M	Febrile period with possible septic shock (Died at long term nursing home, later)
No.09	C.S.	M	Terminal febrile stage (Died at long term nursing home, later)
No.10	K.K.	M	Terminal febrile stage, hyperglycemia
No.11	S.S.	F	Terminal febrile stage
No.12	Y.M.	M	Terminal febrile stage
No.13	T.S.	F	Anorexia, Low body temperature w/o raised heart rate, poor general condition
No.14	T.T.	F	Anorexia
No.15	T.O.	M	Low body temperature w/o raised heart rate, poor general condition, cardiopulmonary arrest
No.16	A.M.	F	Febrile period with possible septic shock
No.17	T.N.	M	Terminal febrile stage
No.18	I.H.	F	Febrile period with possible septic shock
No.19	M.F.	M	Terminal febrile stage, warm shock
No.20	K.N.	F	Terminal febrile stage, paroxysmal tachycardia, Critical limb ischemia occlusive arterial sclerosis
No.21	A.S.	F	pneumonia (died at a long term nursing home)
No.22	K.T.	M	No information on terminal stage because he was staying longterm nursing home
No.23	S.K.	M	Low body temperature w/o raised heart rate, poor general condition, severe respiratory distress
No.24	C.S.	F	Low body temperature fluctuating heart rate, poor general condition, respiratory distress, apnea
No.25	T.N.	M	Consultation at Hosp and Hospital doctor recommended to follow up the patient without treatment
No.26	T.W.	M	Terminal febrile stage
No.27	S.Y.	F	fever, tachycardia, Terminal febrile stage

Table 4 depicts diagnosis made by the doctor when patients arrived the hospital.

Table 4. Diagnosis made by the doctor at hospital ☐ orally given food
☐ gastric tube/intestinal tube, ☐ nasal tube, ☐ total parenteral nutrition (TPN)

No.	Initial of name	Sex	Diagnosis given by the doctor when pt. was taken to the hospital
No.01	H.T.	F	pneumonia & cardiac failure
No.02	C.N.	F	warm shock, cardiac failure
No.03	M.Y.	F	congestive heart failure, aspiration pneumonia
No.04	M.T.	F	
No.05	S.O.	M	
No.06	Y.M.	F	tachycardia, warm shock, hypoglycemia
No.07	K.I.	M	tentative diagnosis UTI
No.08	S.K.	M	left lung atelectasis (when transferred)
No.09	C.S.	M	pneumonia (when transferred)
No.10	K.K.	M	hyperglycemia, pneumonia
No.11	S.S.	F	aspiration pneumonia
No.12	Y.M.	M	aspiration pneumonia
No.13	T.S.	F	
No.14	T.T.	F	removed gastric stoma tube herself and sudden death
No.15	T.O.	M	cardiopulmonary arrest
No.16	A.M.	F	pneumonia
No.17	T.N.	M	pneumonia
No.18	I.H.	F	aspiration pneumonia
No.19	M.F.	M	atelectasis
No.20	K.N.	F	
No.21	A.S.	F	
No.22	K.T.	M	
No.23	S.K.	M	
No.24	C.S.	F	
No.25	T.N.	M	
No.26	T.W.	M	
No.27	S.Y.	F	

Table 5. Span between leave from Roken Towada and death, Place which offered terminal care during this period ☐orally given food, ☒gastric tube/intestinal tube, ☒nasal tube, ☒total parenteral nutrition (TPN)

Group	No.	Initial of name	Sex	Days between leave from Roken Towada and death	Place which offered terminal care right before death
expired at hosital without recovery within 0~8 days 13/27 (48%)	No.17	T.N.	M	0 day	Roken Towada
	No.20	K.N.	F	0 day	Roken Towada
	No.07	K.I.	M	1 day	Roken Towada
	No.11	S.S.	F	1 day	Roken Towada
	No.14	T.T.	F	1 day	Roken Towada
	No.15	T.O.	M	1 day	Roken Towada
	No.24	C.S.	F	1 day	Roken Towada
	No.18	I.H.	F	3 day	Roken Towada
	No.03	M.Y.	F	4 day	Roken Towada
	No.27	S.Y.	F	4 day	Roken Towada
	No.02	C.N.	F	5 day	Roken Towada
	No.16	A.M.	F	8 day	Roken Towada
	No.25	T.N.	M	8 day	Roken Towada
expired at hosital without recovery within 3 months 9/27 (33%)	No.05	S.O.	M	10 day	Roken Towada
	No.10	K.K.	M	11 day	Roken Towada
	No.01	H.T.	F	14 day	Roken Towada
	No.04	M.T.	F	15 day	Roken Towada
	No.12	Y.M.	M	27 day	Roken Towada
	No.26	T.W.	M	27 day	Roken Towada
	No.06	Y.M.	F	36 day	Roken Towada
	No.13	T.S.	F	54 day	Roken Towada
recovered and transferred to clinic with beds, other geriatric institutions, or returned to Roken Towada 5/27 (19%)	No.19	M.F.	M	85 day	Roken Towada
	No.09	S.C.	M	90 day	Tashima Clinic (Clinic with beds), sent from Chuo Hosp
	No.08	K.S.	M	114 day	Asahi Clinic (Clinic with beds), sent from Chuo Hosp
	No.23	S.K.	M	118 day	Roken Towada
	No.21	A.S.	F	408 day	Nursing home Silver
	No.22	K.T.	M	450 day	Ichiyouen (Special elderly nursing home)

Most of 27 patients stayed at Roken Towada until they became critically ill. Table 5 shows the identities of medical institutions or nursing-care facilities which offered health care right before the patients passed away. Table 5 also shows destination of patients who recovered from life threatening-pneumonia, due to which the patients had been sent to either Daiichi Hospital or ChuoHospital.

Types of foods that were given to the patients while at Roken Towada as well as data on whether they had natural teeth of their own or were using dentures are also listed on Table 6.

Out of the 27, nineteen cases were those to whom food (any type of diets from liquid-state food to ordinary food) were orally given until the last day of their lives at Roken Towada, while the other eight cases received nutrition through artificial methods such as with a PEG. Of the eight, three persons received nutrition via a gastric tube, another three cases received nutrition via a nasal tube, while one person was doing so via an intestinal fistula tube with the other receiving nutrition through the TPN tube inserted into her superior vena cava from her subclavian vessel.

Separately from the above-mentioned 27 cases, we added a case report on a person who manifested typical pulmonary infection symptoms only on the final day of his stay at Roken Towada. The patient was admitted to Roken Towada in January 2007. In July of 2008, he was transferred to a hospital in Towada City after his conditions deteriorated suddenly and became critically ill. He stayed at the hospital for about one month and expired there.

Table 6.Types of foods and condition of teeth ☐orally given food
☐gastric tube/intestinal tube, ☐nasal tube, ☐total parenteral nutrition
 (TPN)

No.	Initial of name	Sex	Food	Tooth	False teeth
No.01	H.T.	F	Blended food	None	Full dentures
No.02	C.N.	F	Staple	None	Full dentures
No.03	M.Y.	F	Blended food	None	Full dentures
No.04	M.T.	F	High density liquid diet	None	Full dentures
No.05	S.O.	M	High density liquid diet	None	Full dentures
No.06	Y.M.	F	Finely chopped food & all porridge	None	Full dentures
No.07	K.I.	M	Chopped food	None	Full dentures
No.08	K.S.	M	Staple	None	Full dentures
No.09	S.C.	M	Staple	None	Full dentures
No.10	K.K.	M	Gastrostoma	None	Full dentures
No.11	S.S.	F	All porridge & soft side dish	Some	Full dentures
No.12	Y.M.	M	Staple & soft side dish	Some	Full dentures
No.13	T.S.	F	Finely chopped food & all porridge	None	Full dentures
No.14	T.T.	F	Staple	None	Full dentures
No.15	T.O.	M	Blended food	None	Full dentures
No.16	A.M.	F	Finely chopped food & all porridge	Some	False teeth
No.17	T.N.	M	Gastrostoma	None	None
No.18	I.H.	F	High density liquid diet	None	Full dentures
No.19	M.F.	M	Nasal tube feeding	None	False teeth
No.20	K.N.	F	Intestinal fistula	A few	None
No.21	A.S.	F	Central venous nutrition	Some	Full dentures
No.22	K.T.	M	Finely chopped food & all porridge	None	Full dentures
No.23	S.K.	M	Gastrostoma	Some	Full dentures
No.24	C.S.	F	Nasal tube feeding	None	None
No.25	T.N.	M	Chopped food	All own	None
No.26	T.W.	M	High density liquid diet	None	None
No.27	S.Y.	F	Nasal tube feeding	None	None

Roken Towada's policy on the method with which food are given to patients

Roken Towada has 100 beds and one doctor, who is also the director of the institution, works there on a full-time basis. Roken Towada has followed a policy of helping patients take food orally as long as possible. It has not recommended to any patient or his or her family that he or she be fitted with a percutaneous endoscopic gastrostomy to receive nutrition. There have been cases at which doctors at a hospital built a PEG on some patients after they were transferred from Roken Towada to the hospital because of an NHCAP after infection-induced acute symptoms subsided. These patients were readmitted to Roken Towada after being discharged from the hospital. Consequently, this case report includes cases of some patients who were fed via a PEG.

As for Roken Towada cases who were fed via a nasal tube, such feeding method was adopted only when patients became unable to eat, swallow, or drink any longer and after it was observed that food put by nurses into the oral cavity kept staying there without starting to move toward their pharynx and esophagus due to the disappearance or paralysis of the patient's swallowing reflex. These cases included one case of a patient who was alerted after recognizing a plunge in his inability to swallow food and then did his utmost daily to try to swallow. In this case, the patient recognized that his swallowing reflex involving his medulla oblongata, pharynx and other organs stopped working, making it impossible for food to pass through his throat. Since we could not let the patient stay in bed without taking any fluid or food for subsequent days and months and let him pass away without providing any assistance, we had to start tube feeding by installing a nasal tube on him.

Results

At Figure 1, graphical expression of Table 2, the durations of time that passed between each patients' first contraction of pulmonary infections and their eventual deaths were compared by drawing their survival rate curves. Patients afflicted by pulmonary infections who were given nutrition either via tube feeding or a TPN method lived much longer than those who had been fed only orally. The 50% survival rate at the orally fed group was registered at 11.5 months as against 30.5 months at the group of patients who were fed via either tube-feeding methods or the TPN method. Case number 26 (T.W.) who lived longest at the orally fed

group lived for 48 months, whereas case number 27 (S.Y.) who lived longest at the tube feeding/TPN method group was alive for as long as 71 months.

Figure 1. Survival curves with 95% confidence interval (CI) after the 27 patients developed their first episode of pulmonary infection

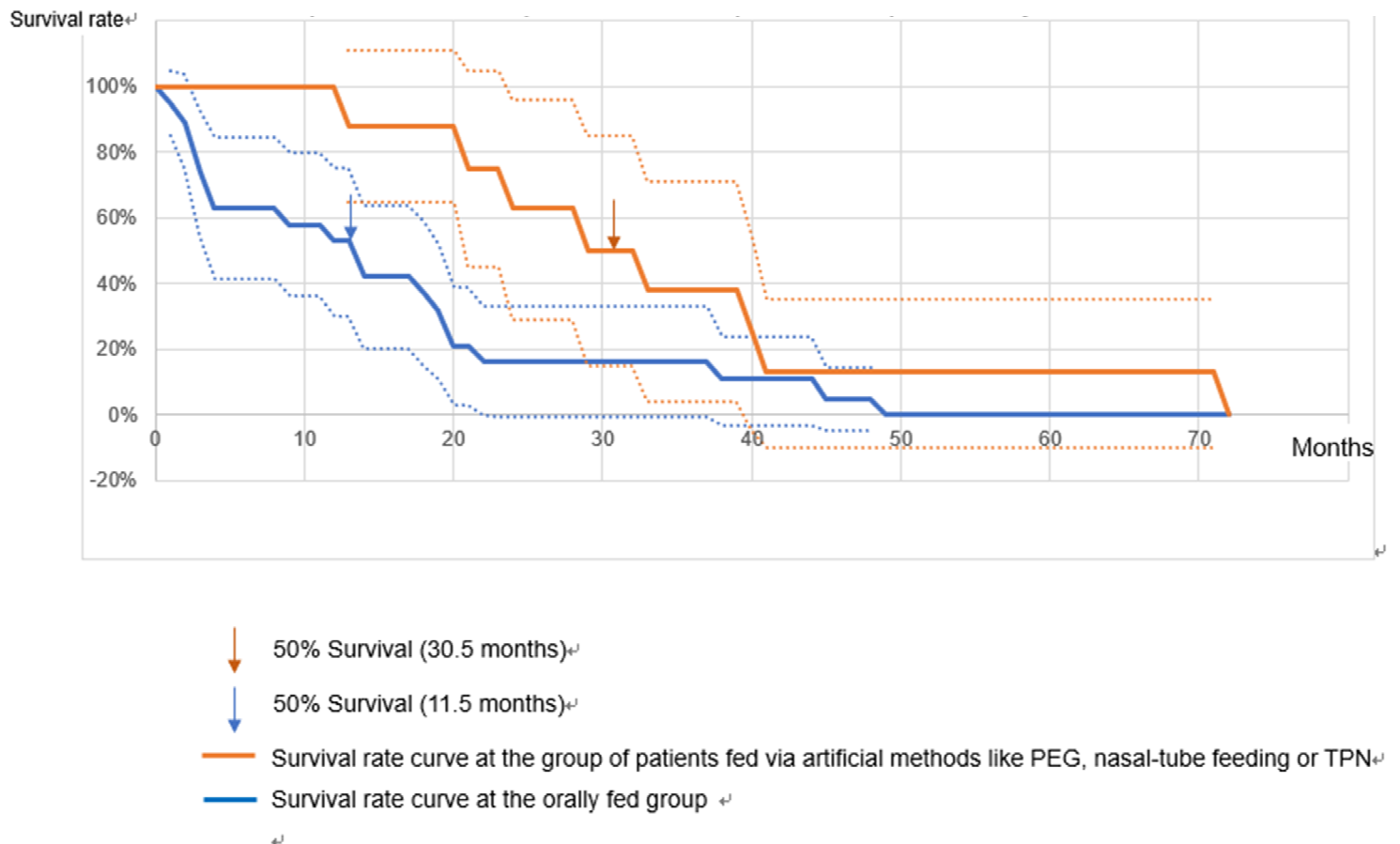
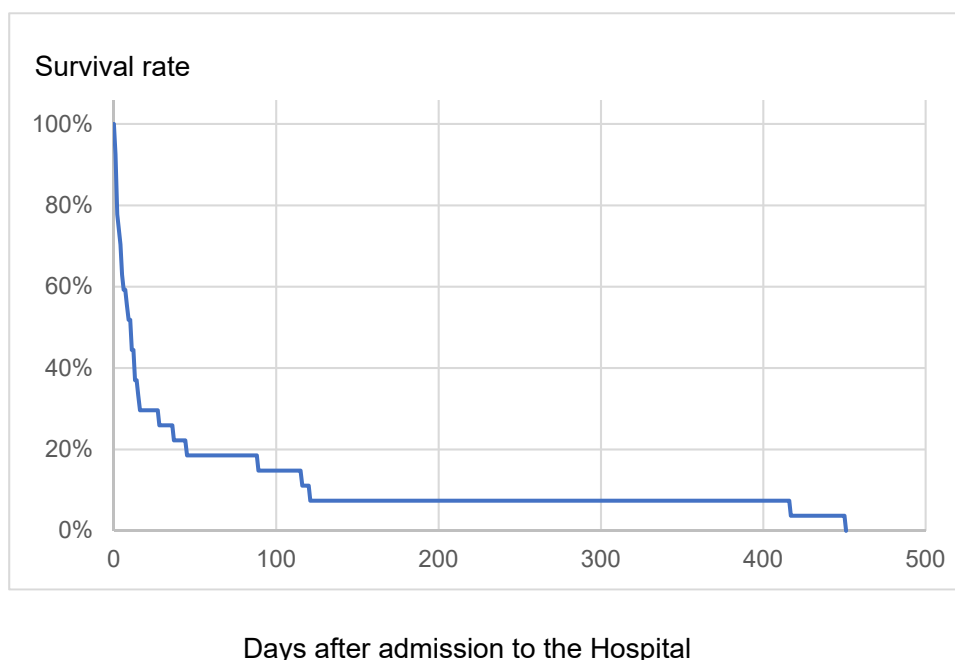


Figure 2, graphical expression of Table 5, shows the survival rates logged by patients after their emergency admissions to the hospital. Only when patients became critically ill and there showed up clear signs that the patients are likely to expire within several days, the doctor allowed such patients to be taken to the hospital by an ambulance. Figure 2 shows how long such patients taken to the hospital lived after their admissions to the hospital. Thirteen of the 27 patients, or 48%, breathed their last within 8 days of hospitalization under such conditions. A separate group of 9 patients (26%) expired 10 to 85 day after admissions to the hospital without complete remission. Five patients had recovered from or overcome pneumonia. Out of these 5 cases, cases number 9 (C.S.) and number

8 (S.K.) were admitted to two separate clinics with beds for in-patients expired at the 90th day and the 114th day following their hospitalization, respectively. Case number 23 (S.K.) was re-admitted to Roken Towada after being discharged from the hospital to which the patient had been transported from Roken Towada, eventually expiring at the 120th day from the initial transfer to the hospital.

Figure 2. Survival rate after emergency admission to the Hospital



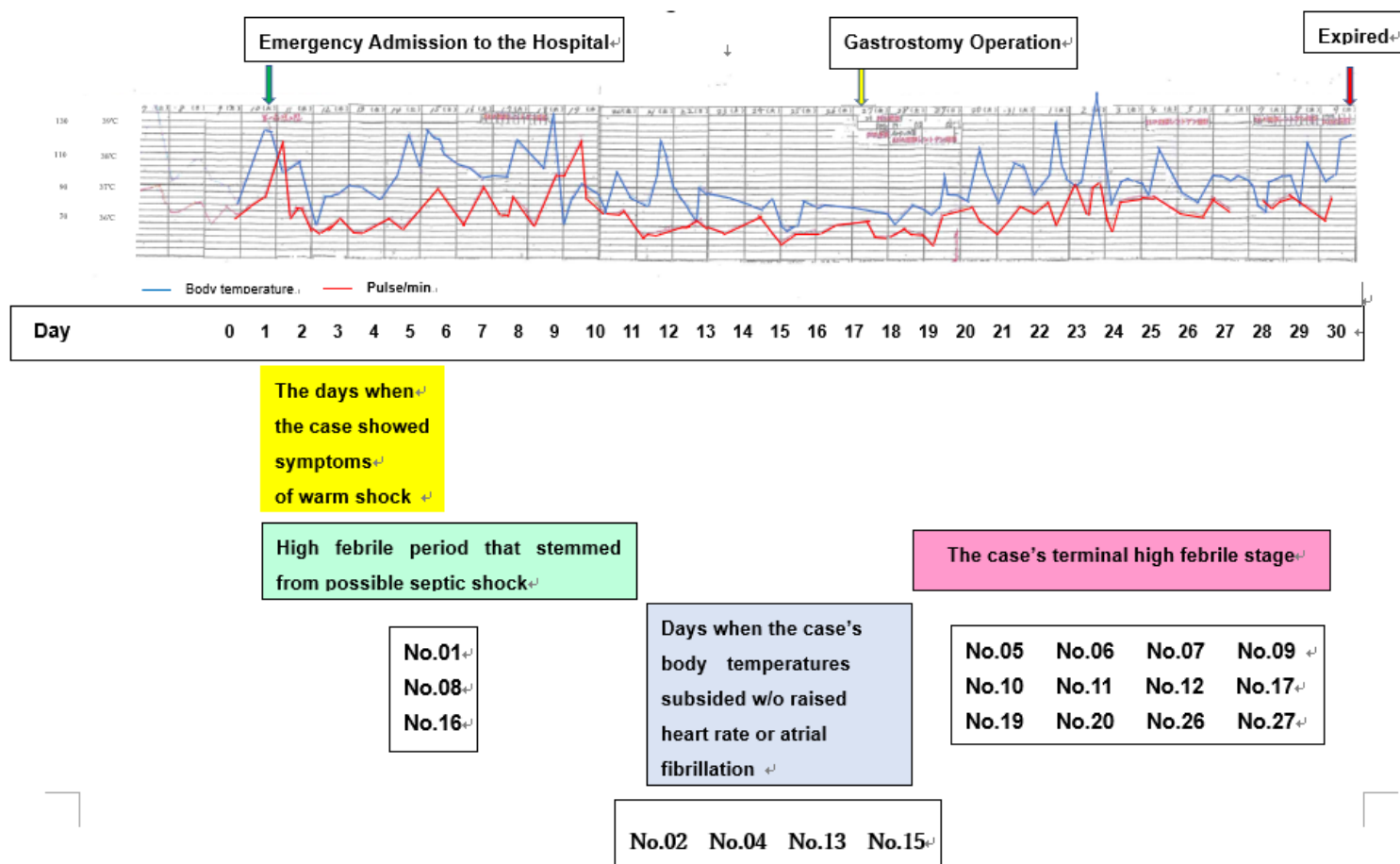
Case number 21(A.S) on whom a TPN apparatus was installed from her subclavian vessel expired at the 416th day after being discharged from Roken Towada, admitted to Medical cort Hachinohe Hospital, then transferred to Nursery Home Silver, breathing her last at Nursery Home Silver where costs of medical treatments are covered by insurance money from the government-managed national health insurance system and where doctor's visits are available.

Among orally fed group who had left Roken Towada, case number 22 (K.T) lived longest after his transfer from Roken Towada expired at the 450th day. This patient, case number 22, had been orally fed while at Roken Towada and was then admitted to a Tokuyo Ichiyoun, the Specific Nursing-Care Home for the Elderly. From the nursing-care home Ichiyoun, he was eventually transferred to a hospital at his closing days and expired there.

Figure 3 shows the chart that accompanies a case report of a patient (S.M) who contracted a typical case of life-threatening pulmonary infection (NHCAP).

The lower side of Figure 3 lists the diagnoses handed down by the Roken Towada doctor for most of the 27 cases shortly before the doctor judged that the patients had to be transferred to hospitals by ambulance. Case numbers of these patients are listed below the three enclosures that show the name(s) of the diagnoses handed down by the doctor. Meanwhile, the upper side of Figure 3 presents the vital sign chart of a male patient that contracted an NHCAP in 2007. His case proved fatal.

Figure 3. Typical Case of Nursing and HealthCare-Associated Pneumonia (NHCAP) from Day 0, e.g. one before the emergency admission



A case report of a 2007 NHCAP case that proved fatal (Figure. 3)

Patient Initial: S.M. Sex: male

Age at admission to Roken Towada: 80Y 4M

Age at discharge from Roken Towada: 81Y 9M

The patient's history of ailments includes hypercholesterolemia, hypertension, and dementia.

When he was receiving nursing care at Roken Towada, he was active and healthy except for the fact that he manifested signs of dementia. Consequently, he walked around the hall of the closed ward for patients with dementia. He showed having a good appetite and could eat meals by himself without receiving any aid from nurses. He used to converse with his daughter whenever she visited him at our facility.

Occasionally, he manifested feverish episodes lasting for a couple of days before such episodes subsided until he became 81Y9M. On one day of July, 2007, (day 4 of the vital chart, Figure 3) his body temperature suddenly shot up to as high as 38.6°C with SpO₂ falling to 87%. Immediately, he was treated with DIV and Cefmetazole. By the late evening of day -1, body temperature had returned to normal levels. At 3:20 pm Day 0, this patient deteriorated to a pre-septic shock state that usually precedes a breakout of a sepsis. His body temperature shot up to 38.7°C, with his elevated blood pressures logging 159/78. His face flushed. Lots of sputum were observed in his airways. Coarse crackles were audible at around both sides of lower third vertebrae at his back chest. Patient was transferred to a near-by hospital under the tentative diagnosis of pneumonia.

For the clinical course which he followed following his admission to the hospital, please see the above chart of his vital signs.

Discussion

Now. Let us take a look at the case of a female patient who had normal levels of intelligence, Case No.14 (T.T.), who became unable of eating usual amounts of foods, eating only a very limited quantity of foods while at Roken Towada. She was then transferred from Roken Towada to a hospital to receive a thorough evaluation and to enable her family to have consultation with the hospital doctor on what types of treatments should be administered in the coming months. The hospital doctor performed a gastrostomy. She pulled out the apparatus by herself and died soon afterwards.

As mentioned earlier in this medical dissertation, the 50% survival rate at the orally fed group was logged at an average 11.5 months, while that at the artificial feeding group was registered at an average 30.5 months. If we were allowed to express our candid expression in a bold manner, we can say that patients who are fed via artificial feeding methods can live longer than orally-fed patients by about 19 months.

Under Japan's health-performance grading system supervised by the MHLW, grades ranging from one to five are assigned to persons who have come to require government-subsidized nursing-care services under the government-managed nursing-care insurance system. The higher a grade of a patient, the more serious the patient's condition and his degrees of debilitation and physical handicaps. The officially assessed MHLW nursing-care grade (health performance grade) assigned to patients who subsist on the basis of artificial feeding methods -- usually bedridden -- is 4 (a notch lower from the highest and most serious grade of 5).

Hence, a combined 350,000 yen medical cost is incurred monthly by the Japanese government and his or her family for patients assigned that grade. Laws requires the government to pay ninety percent of the 350,000 yen out of the nursing-care insurance system account with the remainder payable by the patient's family. As we explained in the preceding paragraphs, a patient subsisting on artificial nutrition methods live longer with an average 19 months being added to their lives, compared with orally fed patients. During this period lasting for 19 months, a total of 6.65 million yen (350,000 multiplied by 19 makes

6,650,000) is spent by the government and family for each such patient. It has been rather a routine practice of doctors in Japan to build a PEG on patients who have come to show a serious difficulty in eating food, often because it takes long time for nurses to feed these patients by handling a spoon. In addition, treating and taking care of such patients assigned high nursing-care grades ensure that nursing-care facilities and hospitals taking care of such patients can rake in lucrative incomes in a stable manner.

The SG group of nursing-care facilities for the elderly has run 12 Rokens in the northeastern region of Japan, known as the Tohoku area. The mean nursing care grades of patients at the group's Rokens, except for Roken Towada whose situation was discussed in this paper, stood at around 4.0. On the other hand, Roken Towada patients' mean nursing care grade stands at 3.4, because Roken Towada has faithfully followed a policy of giving patients food only orally until the last day of their lives at Roken Towada.

Gastrostomy has been regarded as one of emergency medical treatments due to the serious nature of the surgical operation and the seriousness of physical conditions of patients whose health conditions deteriorated to levels at which there is no alternative but to build a PEG. When seniority-associated debilitated person become any longer unable to eat foods on their own, many hospitals and geriatric nursing-care facilities in Japan have tended to build a PEG on such patients, since it is much easier to supply nutrition to such patients via a gastric tube than in cases where health workers at nursery homes for the aged or geriatric health care institutions have to feed them by handling a spoon, a process which often takes along span of time lasting more than 30 minutes per meal. This has resulted in a rapid upsurge in the frequency of PEG installation operations in Japan. The operation fee for the surgery is not negligible at all. A PEG surgery provides a hospital with handsome income of 60,700 yen for each PEG, although the relevant fee was curtailed in 2014 under a legislative revision concerning "point" assigned to such procedure in filing a statement of medical fees with the government.

In addition to this factor, a PEG enables its recipients to live longer than those who opted to refrain from receiving a PEG. Huge PEG-associated budgetary outlays stemming from the two factors have led the Japanese government to face

the need to pay even more to sustain the elderly's nursing care insurance system. This is the reason why the government decided to implement the 2014 revision aimed at slashing the frequency of gastrostomy operations at Japanese hospitals and nursing-care facilities.

Conditions surrounding pulmonary infection cases at the elderly are very different from those at people at younger age brackets. Frail old people who have lived longer beyond the average life spans for males and females are going through the phase of a sunset of their lives. Let us use a figurative expression. Just as household electrical appliances degrade as years of their use go by, a degradation of human bodies also proceed as ages of humans proceed. Seniority-associated debilitations at the elderly compromise their immune system's anti-bacteria or anti-virus defense capability, while undermining the hosts' neuromuscular activity related with acts of swallowing as well as their swallowing and cough reflexes regulated by medulla oblongata and other parts of their brainstems.

Consequently, their bodies oftentimes become unable to prevent food particles, saliva and nasopharyngeal secretions -- into which bacterial flora often get commingled -- from going down to the lower parts of their airways and then into the respiratory tracts, causing episodes of inflammation at the deep parts of their lungs. It is noteworthy that those miscellaneous particles, secretions and other fluids oftentimes carry various types of bacteria which make up bacterial flora that cover humans' nasopharyngeal epithelia.

In consequence, resident-patients at nursing healthcare facilities tend to contract pulmonary infection repeatedly. The pathogens are various bacteria that make up bacterial flora which, in a sense, contaminate humans' nasopharyngeal secretions. These bacteria could not be pathogenic if only humans at whose nasopharyngeal areas they reside are young and healthy. But they could cause pulmonary infections when they reach alveola of their old-age hosts whose immune system have been compromised. In such cases, bacteria that were in the oral cavity intrude into the respiratory tracts and kick off an inflammation. These compromised hosts are oftentimes elderly resident-patients at geriatric health care facilities.

Prevention of such pulmonary infection at the elderly, which can be caused by aspiration of such “contaminated” food particles, saliva and nasopharyngeal secretions, are much harder than at younger people whose immune system has remained healthy and robust. We have to note that aspiration pneumonia and other types of NHCAP often occurs at such debilitated elderly, all of whose organs and tissues have been weakened or even paralyzed. This progress in degrees of frailty naturally occurs at all human beings, many of who may experience NHCAP at geriatric healthcare facilities at the closing days of their lives.

Still there are some recommendable measures which may contribute to preventing such NHCAP cases, although their effects may be limited. Since pathogens of pulmonary infection are bacterial flora that are present at the nasopharyngeal secretions, maintaining good oral hygiene conditions would help reduces the number of bacteria in the oral cavity and thereby be beneficial in preventing NHCAP from taking place. As shown in our figures on the backgrounds of patients, most of patients used to wear full dentures, with some wearing a set of false teeth. Constant care of dentures is very important in removing bacteria at the oral cavity. Wearing dentures is one of risk factors that can induce pulmonary infection. The presence of foreign apparatus like a denture in the oral cavity can stimulate more active secretion of saliva constantly. These secretions, when combined with remnant food particles carrying such bacteria, can cause aspiration pneumonia from time to time if the secretions intrude into lower respiratory tracts through humans’ larynx and airways. Such occurrences may be more frequent than humans want them to be.

Conclusion

NHCAP is oftentimes a disease which delivers a final fatal blow to the elderly. It may be a part of the law of nature. Decisions on whether life-prolonging treatment such as a PEG installation on patients at whom pulmonary infections recur should be adopted and those on if there is a rationale in adopting such treatments or not should be left to doctors.

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