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A retrospective quality assessment of the 7119 call triage system in Tokyo – telephone triage for non-ambulance cases

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Summary

We assessed the accuracy of telephone triage at the 7119 telephone consultation centre in Tokyo. We evaluated walk-in patients at primary care facilities in a clinic or hospital. Nurses asked all patients calling 7119 to join the study and gave them a specific identification number (ID no) at the end of the telephone consultation. The outcome of the consultation was defined as discharge to home (home), admittance to hospital (hospitalization), referral, or transfer to another hospital. After matching consultation records and patient data by ID no, emergency medical physicians reviewed the protocol for problems. During the study, consultation nurses issued an ID no in 17,141 cases, and hospitals and clinics sent back the data on 1205 patients. Among these patients, 1119 cases (93%) were home, 59 cases (5%) were hospitalization, 18 cases (2%) were referral and 9 cases (1%) were transfer. Of the 86 cases which had an outcome of hospitalization, referral or transfer, there were 56 cases with matched patient data. Among these 56 cases, review showed no significant problems with 37 cases. However, there were 11 cases with patient refusal to comply with the triage recommendation, 4 cases with 7119 staff education problems and 4 cases with problems with the protocol itself. We were able to evaluate the 7119 telephone triage system in Tokyo. The study identified three types of problems with the triage process: refusal of telephone triage recommendations, problems with staff education and problems with the protocol itself.

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Introduction

The NHS Direct telephone consultation service was established in the UK in 1997.[1] Similar services have been introduced in Australia,[2] Denmark,[3] Sweden,[4] Canada[5] and the US.[6] These services have contributed to efficient, clinically appropriate health care and to avoiding delays in the provision of emergency care in life-threatening cases. In 2007, the Tokyo metropolitan government established a telephone consultation centre (the 7119 centre), which provides a 24-hour and 7-day a week service. It operates a nurse-run telephone advice line that aims to refer callers to the most appropriate services or to provide them with advice about how to care for their condition. This system has contributed to better use of ambulances in Tokyo and a reduction in the associated costs.[7]

The 7119 centre is located next to the 119 (emergency number in Japan) centre in the Tokyo fire department. Telephone consultations for callers in Tokyo are responded to by an emergency telephone consultation team, which includes a doctor who is trained in emergency telephone consultation, three or four nurses and up to eight call handlers. The computer programmed medical protocols were developed by the Committee of Emergency Medicine of the Tokyo Medical Association.

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Emergency medical system in Tokyo

Emergency facilities in Japan are classified into three levels based on resources, administration and staff. Primary emergency facilities provide care for walk-in patients, secondary emergency facilities provide hospital care for acute illnesses and trauma, and tertiary emergency facilities, called Life-Saving Emergency Centres, provide care for critical illness and severe trauma.[8] Patients are transported to secondary and tertiary facilities only by ambulance. There is no system for "general physician" and walk-in patients receiving care at a primary care facility to freely access these hospitals or clinics. Many patients have a family doctor at a clinic or hospital and they would consult them by telephone or other means if they have a medical concern. The 7119 triage system can be used by patients who may not have a family doctor or cannot consult with a doctor because it is outside business hours. In 2008, there were 648 hospitals and 12,572 clinics[9] in Tokyo and almost all of these facilities belonged to the Tokyo Medical Association.

The 7119 protocol

Each consultation is classified into one of five triage categories (red, orange, yellow, green and blue) based on perceived severity[7], see Table 1. The 7119 triage process consists of 3 steps (Figure 1). In step 1, a call handler receives a patient call and takes information about patient identification and the purpose of calling. If the purpose of calling is only to search for a hospital, the call handler can provide the telephone numbers of several hospitals which a patient can visit, from a computer database and finish the consultation. If the purpose of calling is for a medical consultation, e.g. when a patient should visit a hospital and which department he or she should choose, the call handler connects the patient to a telephone consultation nurse. During step 1, if certain key words occur, such as cardiac arrest, no respiration, no pulse, submersion, or cold body, the call handler should immediately connect to the 119 centre to send an ambulance (category red).

In step 2, the telephone consultation nurse asks the patient questions regarding severe, abnormal physiological signs. The questions regarding severe, abnormal physiological signs relate to airway, breathing, circulation and dysfunction of the central nervous system. If the consultation nurse feels there is a severe physiological abnormality from the answers, he or she must connect to the 119 centre to activate the emergency ambulance system (category red). If there are no symptoms of severe physiological abnormality, the consultation nurse can go to step 3.

In step 3, there are 98 symptom-specific protocols for injuries or diseases, such as chest pain, headache or dyspnoea, including 18 for paediatric cases. At each protocol the consultation nurse asks a series of questions to determine the five-level triage category. Each question is designed to identify a specific condition and has a code to verify quality later. The triage category may be based on the specific condition revealed by these questions. For example, in the headache protocol, a strong headache with sudden onset may indicate subarachnoid haemorrhage; this triage category should be red. The consultation nurse can also decide which department of a hospital or clinic a patient will attend using this protocol.

We arranged the questions from red to orange to yellow to green to blue during protocol design and built them into the computer program. The consultation nurse

Table 1. The 7119 triage categories.

Triage category	Recommended attendance	Example	Action after consultation
Red	Immediately call 119 for an ambulance	Disorder of airway, breathing and circulation. Unconsciousness, convulsion, massive haemorrhage, intolerable pain.	Delivery to secondary or tertiary emergency facilities by ambulance
Orange	Urgently seek help within approximately 1 h	Paediatric high fever, continuous vomiting, tolerable severe pain, uncontrollable minor haemorrhage	Attend emergency hospitals, guided by the Tokyo fire department computer system
Yellow	Urgently seek help within approximately 6 h	Adult high fever, history of unconsciousness, tolerable moderate pain	Attend clinics and hospitals, guided by the Tokyo metropolitan medical institution information centre on the Internet
Green	Non-urgent case. Seek help within the next 24 h	Mild fever, single vomiting episode, tolerable mild pain	Attend clinics and hospitals, guided by the Tokyo metropolitan medical institution information centre on the Internet
Blue	Non-urgent case. No need to attend hospital or clinic	None of the above	Observation at home with advise by consultation nurses

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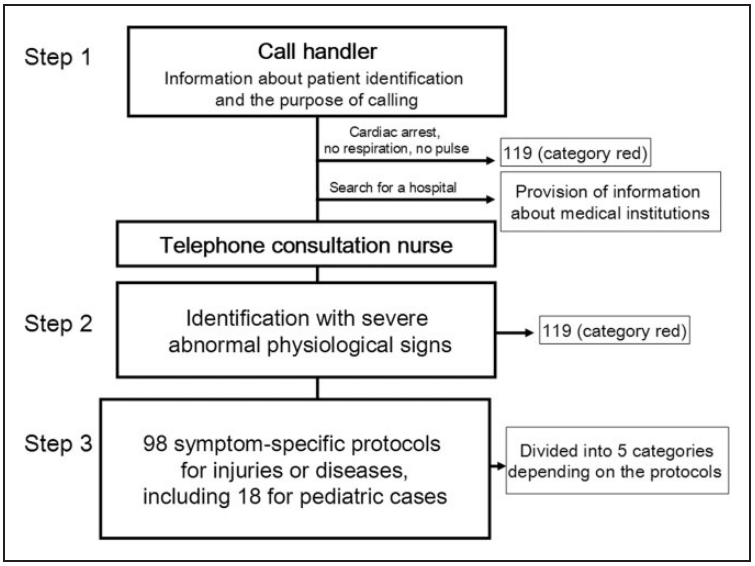


Figure 1. The three steps in the 7119 triage process.

can use these protocols at a computer, based on the patient complaint. If the consultation nurses feel that it is difficult to give the appropriate advice to patients, they can consult a telephone consultation doctor. Consultation nurses make a consultation record for each patient after the consultation. These records include who called, patient age and gender, chief complaint, information about vital signs, triage level and institution and department introduced by the nurse.

At the orange triage level, nurses give the names and telephone numbers of some emergency hospitals nearest to the patient, guided by the computer system at the Tokyo fire department. These emergency hospitals always send information regarding in which departments they can treat patients to the Tokyo fire department. At the yellow and green triage levels, nurses recommend that patients attend clinics and hospitals guided by the so-called ''Himawari'' principle (Himawari means sunflower in Japanese), a Tokyo metropolitan medical institution information centre on the Internet, and give information about these clinics and hospitals to patients. At the blue triage level, observation at home with advice by consultation nurses would be recommended to patients (Figure 1).

Aim

In the present study we investigated the 7119 process by reviewing the outcome of triage in order to identify problems with this system.

Methods

We evaluated walk-in patients at primary care facilities in a clinic or hospital. Nurses asked all patients calling 7119 to join the study and gave them a specific identification number (ID no) at the end of the telephone consultation if the patient agreed to join the study. This ID no was used to match consultation records and patient data. After treating the patient at a clinic or hospital, staff were asked to send the patient data by fax to the Tokyo Medical Association every month. Patient data included ID no, time of attendance, name of injury or disease and outcome. The study was approved by the appropriate ethics committees.

The outcomes were defined as:

1. home (patients were discharged home after attendance at the hospital or clinic)
2. hospitalization (patients were admitted immediately after attendance at clinic or hospital)
3. referral (patients were referred to another clinic or hospital)
4. transfer (patients were transferred immediately).

For the home cases, three emergency medical physicians reviewed data from the medical institution to check whether severe injury or disease could be expected. For the other cases (hospitalization, transfer or referral), four emergency medical physicians reviewed the reliability of the triage process. Because this was an exploratory study to determine whether there were any problems with the 7119 triage process, these physicians identified what kinds of problem each case had in their clinical experience. The physicians worked together around a table and identified and categorized the problems simultaneously, looking at identical copies of the consultation records and patient data.

Results

Starting in November 2008 and ending in June 2011, data were collected intermittently for a total of 17 months. In total, the nurses received 88,651 cases: 18,629 (21%) cases

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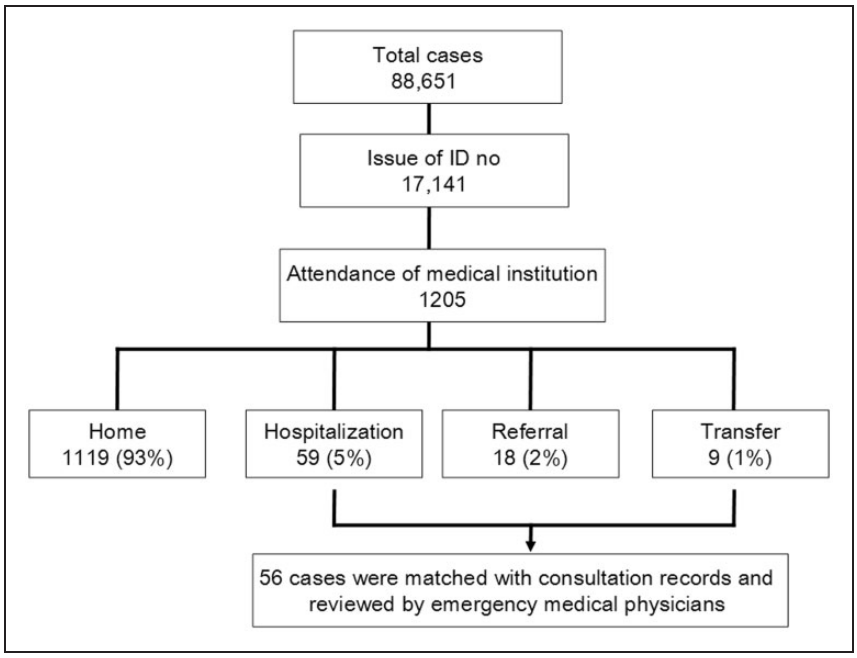


Figure 2. Triage cases.

Table 2. Cases where patient data matched with consultation records.

Result of review	Number of cases	Age, years (SD)	Gender (M/F)	Outcome	Triage level
Refusal of telephone triage	11	53 (34)	4/7	Hospitalization	Red (n = 10) Orange (n = 1)
Problem with staff education	4	51 (42)	1/3	Hospitalization	Orange (n = 2) Yellow (n = 2)
Problem with the protocol itself	4	18 (34)	1/3	Hospitalization	Orange (n = 4)

were determined to be red triage level, 35,094 (40%) were orange, 19,171 (22%) were yellow, 11,373 (13%) were green, 2604 (3%) were blue and 1780 (2%) were unclassified. Consultation nurses were able to issue an ID no in 17,141 cases.

At the time of the study 1205 patients, tagged by ID no, attended a total of 511 hospitals and clinics. The outcomes of these 1205 cases were as follows: home 1119 cases (93%), hospitalization 59 cases (5%), referral 18 cases (2%) and transfer 9 (1%) cases (Figure 2). There were no significant problems for the home cases. Of the 86 cases with an outcome of hospitalization, referral or transfer, patient data was matched with consultation records by ID no in 56 cases and 33 cases were not matched, mainly because the ID no seemed to have been missed by the patients. These matched cases were reviewed by emergency medical physicians to identify problems with the 7119 system. In 56 peer reviewed cases, 37 cases (68%) had no significant problems. We were able to identify three types of problems in 19 cases: refusal to comply with the triage recommendation in 11 (20%), problems with staff education in 4 (7%), and problems with the protocol itself in 4 (7%) (Table 2). Refusal was defined as a patient's refusal to comply with a recommendation from a nurse indicated by the protocol. In most cases the patients refused to use an ambulance in spite of the nurse's recommendation to do so. Six patients in this category were over 65 years old, and 5 of the calls for these 6 patients were made by family members. Three of the patients were infants under 2 years old, and the telephone call was made by their mothers. Staff education problems were defined as a lack of understanding of the usage of the protocol by staff, including nurses and physicians. Mistaken use of the protocol may have occurred because of a lack of understanding of telephone triage, and patients were allocated to a triage level lower than appropriate.

The four cases with a problem with the protocol are shown in Table 3. In case 1, a 69-year-old woman had abdominal pains with vomiting; the call was made by her daughter. In her medical history, she suffered from ileus (intestinal obstruction). There was no question

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Table 3. Cases with protocol problems.

Case	Age	Gender	Protocol	Triage level	Outcome	Disease/ injury	Caller
1	69 y	F	Abdominal pain	Orange	Hospitalization	Ileus	Daughter
2	3 mon	F	Fever, paediatric	Orange	Hospitalization	Viral pneumonia	Mother
3	1 y	M	Fever, paediatric	Green	Hospitalization	Otitis media	Mother
4	6 mon	F	Medication error	Orange	Hospitalization	Medication error by mother	Mother

about medical history in the abdominal pain protocol. Cases 2 and 3 were paediatric patients with fever; the calls were made by their mothers. The children were aged 3 months and 1 year respectively. They did not have a chief complaint because of their very young ages. In case 4, a baby with 8 kg bodyweight was mistakenly administered too large a dose of an antipyretic drug (50 mg of diclofenac sodium).

Discussion

In the present study, we defined the outcomes as home, hospitalization, referral and transfer. It appears that home cases may not have been treated with a specific therapy at a hospital and may not have needed to urgently attend hospital by ambulance. Therefore, we can guess that the 1119 home cases (93%) might have been well triaged using the 7119 triage process. On the other hand, patients with outcomes of hospitalization, referral and transfer might have been undertriaged. Since we did not have a valid way to audit the triage system, such as telephone triage, at the pre-hospital care stage, further work is needed to determine the accuracy of emergency and urgent triage at the pre-hospital stage.

The problem of refusal of telephone triage may be partly caused by a lack of understanding of the triage system by citizens. Based on a self-administered, questionnaire-based survey, Kawakami *et al.* reported that 949 (47%) of 2029 people would hesitate to call an ambulance.[10] In 10 cases in our study patients refused to use an ambulance, although the triage nurse decided on a red triage level and recommended the use of an ambulance. This may be the result of a particular mentality in Japan, in hesitating to use an ambulance. This hesitation may sometimes be dangerous and suggests that the telephone triage system should be advertised widely, using lectures, the Internet and posters. Some emergency diseases and injuries become worse very rapidly; patients with such diseases or injuries should certainly be delivered by an ambulance. It may therefore be prudent to educate citizens before hospitalization on why some diseases and injuries are emergencies.

The patient's refusal of transport to hospital by emergency medical technicians was termed as "refusal of medical aid" (RAM).[11] We identified a similar problem in telephone triage. Moss *et al.* reported that 70% of RAM patients were over the age of 65 years.[12] In the present study, 55% (6 of 11) were over the age of 65 years and 27% (3 of 11) were under the age of 2 years. Moreover, in 73% (8 of 11) the calls were made by their families. There may have been specific patterns in this category, and further investigation would have enabled us to treat these patterns more effectively. Further work is required.

There were educational problems for staff in four cases. A lack of understanding of the protocol resulted in non-emergency triage for patients who may have needed emergency treatment. Education and auditing of the triage process for the triage nurses may be essential for successful management of the telephone triage system.[13,14] New nurses are trained by lecture for 2 weeks, by on-the -job training with an educator for 2 weeks and have their skills checked by a physician twice. At telephone triage there may be many kinds of patients, including some reluctant patients. A triage nurse may need to be quite blunt about the risk of death if the recommendation is not followed. Glasper *et al.* reported that they emphasized communication through role play in telephone nurse education courses.[14] In our education course, nurses are educated through role play with many different kinds of cases, including reluctant patients. The triage process was audited by nurses and doctors from the triage quality review board. The results may improve the education system and the verification department. The study also identified a lack of understanding about the concept of triage in some staff. Staff need to recognize the danger of undertriage and understand that a system permitting overtriage can minimize the danger.[15] The importance of these concepts should be stressed in staff education.

In case 1 of Table 3, the patient suffered from abdominal pain due to ileus. In the abdominal pain protocol, there are no questions regarding medical history such as having ileus. There were also no questions regarding a medical history of ileus in the protocol of abdominal pain in adults of the Manchester triage protocol.[16] In the telephone triage protocols of abdominal pain for nurses in Portland, Oregon, USA, they ask for medical history about diabetes, heart disease, blood clotting problems, congestive heart failure, pregnancy, hepatitis and nervous stomach, but they do not ask about ileus.[17] We therefore need to investigate whether a history of ileus is one of the key questions to determine triage level in the abdominal pain protocol.

In cases 2 and 3 of Table 3, the triage nurses used the paediatric fever protocol and the patients were too young (3 months and 1year) to describe their symptoms. The telephone caller in each case was the mother. It is very difficult to determine triage level by telephone when there are no complaints, such as with babies. Morimura *et al.*

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reported that avoiding vague language and giving specific instructions for checking a patient led to a high rate of successful communication in a simulated emergency call study with volunteers.[18] The protocol for telephone triage of babies that cannot complain may need to contain specific instructions for mothers to check the status of the babies. In case 4 of Table 3, the triage nurse used the overdose protocol. However various overdose situations may exist and it may be very difficult to decide triage level with a single protocol for overdose patients.

In telenursing, videoconferencing is sometimes used.[19] In the future, triage reliability may be greater if visual systems are employed. In auditing the triage process, it was very difficult to match a consultation record and triage outcome at hospital. If these could be retrospectively analysed with shared electronic medical records, it would be easier and more cost-effective.

The present study had certain limitations. At the time of study consultation nurses were able to issue an ID no for 17,141 cases who agreed to join the study and 1205 (7%) patients, tagged by ID no, attended hospitals or clinics and returned information regarding their outcome. Patients had no incentives and cooperated voluntarily. There may have been some selection bias since patients who agreed to the study may have been more cooperative people. However, we note that one study reported that volunteer disease registries can be highly representative and provide an excellent, convenient sample for multiple sclerosis.[20] Furthermore, in 86 cases with an outcome of admitted, referral or transfer, 33 cases were missing an ID no, probably because the wrong ID no was given by patients. Only the patients who could give their ID no exactly were evaluated. Therefore this result may have some bias. However, it was the first exploratory study for evaluation of telephone triage in Japan.

Conclusion

We were able to evaluate the telephone triage system (7119) in Tokyo and to identify three types of problems with the triage process: refusal of telephone triage recommendations, problems with staff education and problems with the protocol itself. We now need to establish an evaluation system to allow more accurate auditing of the telephone triage process and review patient outcomes.

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