

Circumstances Surrounding outbreak in Tuen Mun Hospital

Investigation Report of SARS Outbreak  
in Ward C8, Tuen Mun Hospital (TMH)  
16<sup>th</sup> June 2003

1. Incident Summary

Between April 26 and 27, 2003, 3 staff working in C8 were reported sick and admitted. This was immediately regarded as a likely outbreak in C8 and urgent actions were taken to investigate the possible causes, prevent further spread of the infection and implement necessary improvement measures. At the conclusion of the C8 outbreak in early June, a total of 5 staff, 10 patients and 1 patient relative were confirmed as having clinical SARS.

2. Background

2.1 Ward Nature

C8 is an acute medical ward taking care of both emergency and clinical admissions of female medical / geriatrics cases.

2.2 No Visiting Policy

Starting from April 3, the general policy of no visiting except in extraordinary circumstances for the acute wards of TMH was implemented. Where exceptional visiting was required, the visitors needed to adopt strict precautions and with contact particulars registered.

2.3 Personal Protection Equipment Standard

In early April the cluster management was fully aware of the possibility that a proportion of SARS patients might not have any apparent symptoms referable to SARS on admission. Hence, the infection control measures in all medical wards were stepped up to the isolation ward standard since April 7. Ward staff and in fact anybody entering the wards were required to wear a full set of Personal Protection Equipment. The Personal Protection Equipment available to the staff included cap, mask (surgical / N95), eye

protection apparels (eye shield / goggles / mask with visor / face shield), glove and protective gown.

#### 2.4 Fever Cohort Area For Isolation of High Risk Cases

A special fever cohort area was established in each medical ward since April 8 to isolate patients with febrile illnesses and respiratory infection. The infection control measures were further enhanced in these fever cohort areas.

#### 2.5 Contact Tracing Team Infrastructure

On April 5, a dedicated contact tracing team was established in response to the possibilities of patient admission into general ward that might subsequently turned out to have SARS. A set of contact tracing guidelines was developed on April 7 and was subsequently communicated to frontline staff on April 14. Direct liaison with Department of Health (DH) was established since then and both parties agreed on a collaboration model with clear role delineation. Whenever there were possible cases, the contact tracing team would obtain the essential data on staff duties, generate relevant patient list (including all existing in-patients, discharged and transferred out cases) during the indicative tracing period and categorize patients according to the level of risk and implement tracing actions. The team would also directly liaise with DH daily on tracing the discharged patients. Concurrently, the infection control team would be activated to assess the infection risks and initiated the required follow-up actions.

### 3. Results Of Investigation On Cause Of Outbreak

#### 3.1 Investigation Process

In order to study the route of spread of the infection and identify the underlying causes, the hospital management decided to review events from April 1 onwards with major focus on activities after April 13. April 13 was the date 10 days prior to the earliest date of symptom onset among the cases of staff infection. The infection control team led by the consultant microbiologist interviewed the infected staff and reviewed all relevant patient records.

### 3.2 Index Cases Identification

Within the review period, there were 5 SARS patients with previous admission history to C8 ward in early April. Detailed study showed that they were not related to the present outbreak. From the analysis of the remaining cases, it was concluded that two unsuspected patients in C8 were the sources of infection with respect to this outbreak. These 2 patients did not present with features of SARS infection on admission. These 2 index cases led to the subsequent SARS infection of 5 staff, 10 patients and 1 patient relative. Appendix 1 is a summary table detailing patients with suspected / confirmed SARS relating to C8 incident. The epidemic curve is enclosed in Appendix 2. The possible pathway of spread of the virus from the index cases to other patients and staff is shown in Appendix 3.

### 3.3 Index Case 1

D

Index case 1 ( ) was a young, fit and ambulatory lady. Three days after returning from Shanghai, she was admitted through TMH Accident and Emergency Department (AED) on April 10 for fever, chills and myalgia. The fever subsided shortly after admission and the patient remained afebrile. Since there were no chest X-ray changes and there were no lung infiltrates even on HRCT, she was not diagnosed as a SARS case. Antibiotics treatment was started and she was discharged on April 14. She presented again on April 21 and was later diagnosed as having SARS. It is likely that she was having the disease during her first admission.

### 3.4 Index Case 2

E

Index case 2 ( ) was admitted to Princess Margaret Hospital C3 SARS ward on April 2 as a suspected SARS patient. She was subsequently classified as a non-SARS case and was discharged on April 11. She then presented to TMH AED on April 18 and was admitted to C8 for fever, chills and myalgia. There was no chest X-ray change and the fever subsided shortly after admission and the patient remained afebrile for days before fever was up again. The patient was a 73-year-old elderly, she was up and about and went to toilet herself most of the time. Occasionally, she did require the use of bedpan.

Although the above 2 index cases did not present with diagnostic clinical features of SARS on admission, the risks of having early SARS infection were recognized. They were admitted to the fever cohort area in C8 for further investigation and observation. For TMH, as an acute hospital

serving a population of one million, the number of patients exhibiting these non-specific signs of possible infection requiring in-patient care was on average more than 120 per day. Close observation and monitoring were done on these patients on the disease progress, development of new clinical signs and symptoms, blood results and radiological changes in order to pick up and intervene a probable SARS cases at the earliest moment. For these two index cases, the rapid resolution of the initial fever followed by the presence of a long afebrile period before the fever reappearace and the lack of radiological chest changes in the early phase of presentation made early diagnosis of SARS impossible.

### 3.5 Staff Infection

The infection control team also studied in detail the possible causes of the infection among the 5 staff. The most important breach of infection control practice identified was on inadequate hand washing. This issue was particularly relevant to the setting of C8 where a large number of elderly and debilitated patients required personal care and assistance in feeding and handling of the excreta. Lack of awareness on wearing full PPE among the non-clinical staff was another contributing factor.

## 4. Actions Taken To Control The Spread Of infection

The concerted efforts of both infection control and contact tracing teams helped prevent further spread of the infection among staff and patients in C8.

### 4.1 Immediate Actions & Teaming With Department of Health

From April 27 onwards, all patient admissions, transfer and discharge in C8 were stopped unless instructed by the hospital management. The DH was duly notified on April 27 and a plan on contact tracing was jointly worked out in a meeting on April 28. As mentioned above, all cases related to C8 since April 1 were reviewed in the contact tracing exercise.

### 4.2 Contact Tracing On The Discharged Patients & Call Back Of Discharged Institutionalized Patients

High-risk patients discharged to the old age homes or other institutions were called back to C8. Those who were discharged home and persons who had been to C8 were followed up by DH. They would be called back once they developed symptoms suspicious of SARS. A daily updated

discharged patient list was provided to AED to facilitate consultation process and to alert AED staff that certain patients were a close / social contact of SARS patients in the C8 outbreak. To prevent over-congestion of C8, 15 patients called back from the community were placed in A8 ward under separate isolation environment.

#### 4.3 Contact Tracing On Staff

The remaining C8 staff were counseled and instructions on home precautions and isolation were given. They were required to watch out for their own health conditions, report daily to the contact tracing team and seek medical attention once they developed probable symptoms of SARS, eg, fever and muscle pain.

#### 4.4 Monitoring Of Cohorted Patients With Contact History

##### 4.4.1 Observation Period

The cohort period was initially defined as 10 days after possible exposure to potentially infective case. In mid May, the cohort period was extended to 14 days in view of the observation that delayed onset of symptoms could occur in the elderly patients.

##### 4.4.2 Close Surveillance & Observation

The medical conditions of the in-patients under cohort observation were reviewed and closely monitored daily. Repeated surveillances among the cohort cases using reverse transcription - polymerase chain reaction (RT-PCR) technique to detect corona virus in saliva were conducted in order to pick up the virus in the early phase of SARS disease.

During the cohort period, patients developing symptoms compatible with SARS would be sent to the SARS ward.

##### 4.4.3 Patient Follow Up After Completion Of Observation

Patients who remained well after observation period were either discharged back to old age homes or their own homes. These discharged patients would then be followed up by community geriatric assessment team or community nurses respectively. Some patients were transferred to Pok Oi Hospital for continuation of rehabilitation and observation.

## 5. Extra Measures to Break The Infection Chain

### 5.1 Disinfection & Closure Of C8

In early May, the hospital management decided to close C8 ward for disinfection and transfer the cohorted patients to A5 ward which was previously equipped to accommodate SARS patients. The new team of experienced and vigilant staff there coupled with the clean and specially equipped ward environment would facilitate more effective infection control.

### 5.2 Further Spacing Out Patients

To facilitate further spacing out of patients while cohorting, lower risk patients were also transferred to Wong Tai Sin Hospital for further cohort observation. Between May 2-6, 20 cohorted patients in A8 & C8 ward were transferred to A5 ward where the patients were better spaced out in rooms or cubicles. 11 cohorted patients were transferred to Wong Tai Sin Hospital on May 6. C8 ward was then closed for disinfection on May 7 and all ward staff were granted special leave for isolation to prevent cross infection.

### 5.3 Use Of Single Rooms To Enhance Isolation

In end May, the hospital management embarked on a second strategic move to transfer the remaining 7 patients in A5 to ward B7 which had single rooms for isolation enhancement. The patient transfer to B7 took effect from May 29 onwards. Altogether, the contact tracing exercise effectively traced 132 patients, 87 staff and 51 persons who had been to C8.

## 6. Outcome Summary

In the C8 outbreak, a total of 5 staff, 10 patients and 1 patient relative were confirmed as having clinical SARS. Upon recognition of the outbreak, TMH has taken prompt actions to prevent further spread of the virus. The last confirmed case was contact case 13 who was transferred to SARS ward on May 21. *With our effective contact tracing, there is no sign of spread of the infection to the community.* The whole cohort and surveillance exercise finally ended on June 4.

Appendix 1:

C8 Patients With Suspected / Confirmed SARS Relating To The Current Outbreak

Case No	Diagnosis	Name	Onset date	Date of Admission	Discharge	Date Discharge
Index 1	Clin SARS	D [REDACTED]	20 <sup>th</sup> April, 2003	21 <sup>st</sup> April, 2003	WTS	2 <sup>nd</sup> May, 2003
Index 2	Clin SARS	E [REDACTED]	17 <sup>th</sup> April, 2003	18 <sup>th</sup> April, 2003	WTS	9 <sup>th</sup> May 2003
Contact 1	Clin SARS	[REDACTED]	27 <sup>th</sup> April, 2003	7 <sup>th</sup> April, 2003	WTS	16 <sup>th</sup> May 2003
Contact 2	Suspect	[REDACTED]	27 <sup>th</sup> April, 2003	18 <sup>th</sup> April, 2003	Died	5 <sup>th</sup> May, 2003
Contact 3	Clin SARS	[REDACTED]	5 <sup>th</sup> May, 2003	26 <sup>th</sup> April, 2003	PMH	12 <sup>th</sup> May, 2003
Contact 4	Clin SARS	[REDACTED]	6 <sup>th</sup> May, 2003	28 <sup>th</sup> April, 2003	Died	14 <sup>th</sup> May, 2003
Contact 5	Clin SARS	[REDACTED]	5 <sup>th</sup> May, 2003	28 <sup>th</sup> April, 2003	Died	12 <sup>th</sup> May, 2003
Contact 6	Clin SARS	[REDACTED]	7 <sup>th</sup> May, 2003	28 <sup>th</sup> April, 2003	Died	16 <sup>th</sup> May, 2003
Contact 7	Clin SARS	[REDACTED]	28 <sup>th</sup> April, 2003	21 <sup>st</sup> April, 2003	Died	22 <sup>nd</sup> May, 2003
Contact 8	Suspect	[REDACTED]	12 <sup>th</sup> May, 2003	23 <sup>rd</sup> April, 2003	Died	19 <sup>th</sup> May, 2003
Contact 9	Clin SARS	[REDACTED]	13 <sup>th</sup> May, 2003	26 <sup>th</sup> April, 2003	Died	17 <sup>th</sup> May, 2003
Contact 10	Clin SARS	[REDACTED]	14 <sup>th</sup> May, 2003	23 <sup>rd</sup> April, 2003	Died	10 <sup>th</sup> June 2003
Contact 11	Suspect with Treatment	[REDACTED]	14 <sup>th</sup> May, 2003	26 <sup>th</sup> April, 2003	B7	11 <sup>th</sup> June 2003
Contact 12	Clin SARS	[REDACTED]	15 <sup>th</sup> May, 2003	26 <sup>th</sup> April, 2003	Died (in WTSH)	5 <sup>th</sup> June, 2003
Contact 13	Clin SARS	[REDACTED]	19 <sup>th</sup> May, 2003	29 <sup>th</sup> April, 2003	Died	24 <sup>th</sup> May, 2003
Contact 14	Suspect with Treatment	[REDACTED]	?	27 <sup>th</sup> April, 2003	Died	27 <sup>th</sup> May, 2003

Staffs admitted with / subsequently diagnosed to be suspected SARS / confirmed SARS. (During the period 1<sup>st</sup> April, 2003 to 7<sup>th</sup> May, 2003)

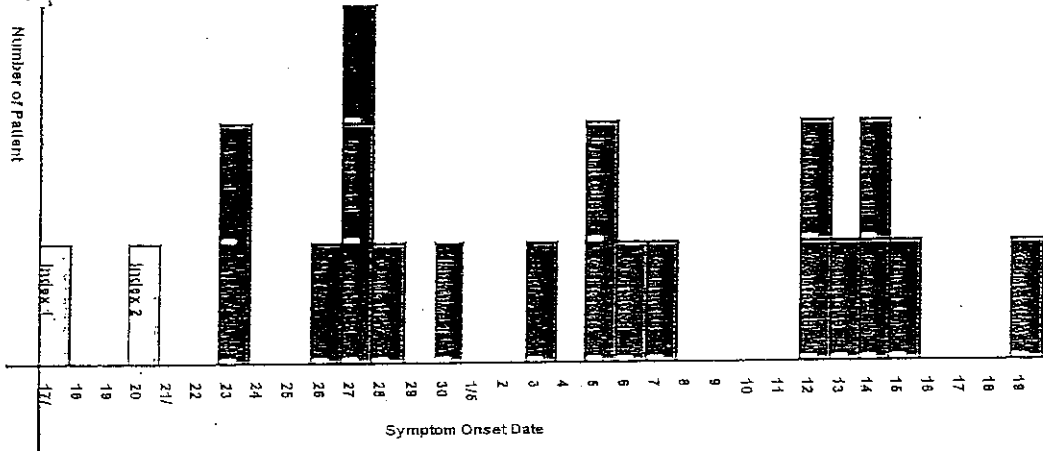
Case No		Ward / Rank	Name	Onset date (Fever)	Admission Date
	Clinical SARS	RN	[REDACTED]	20 <sup>th</sup> April, 2003	20 <sup>th</sup> April, 2003
Staff 1	Clinical SARS	RN	[REDACTED]	23 <sup>rd</sup> April, 2003	26 <sup>th</sup> April, 2003
Staff 2	Clinical SARS	Ward steward	[REDACTED]	23 <sup>rd</sup> April, 2003	26 <sup>th</sup> April, 2003
Staff 3	Clinical SARS	NO	[REDACTED]	26 <sup>th</sup> April, 2003	29 <sup>th</sup> April, 2003
Staff 4	Clinical SARS	GCA	[REDACTED]	27 <sup>th</sup> April, 2003	27 <sup>th</sup> April, 2003
Staff 5	Clinical SARS	GSA	[REDACTED]	3 <sup>rd</sup> May, 2003	3 <sup>rd</sup> May, 2003

[REDACTED] had been on 2 weeks of leave before onset of symptom and our investigation showed that she had never encountered the index patients.



Appendix 2

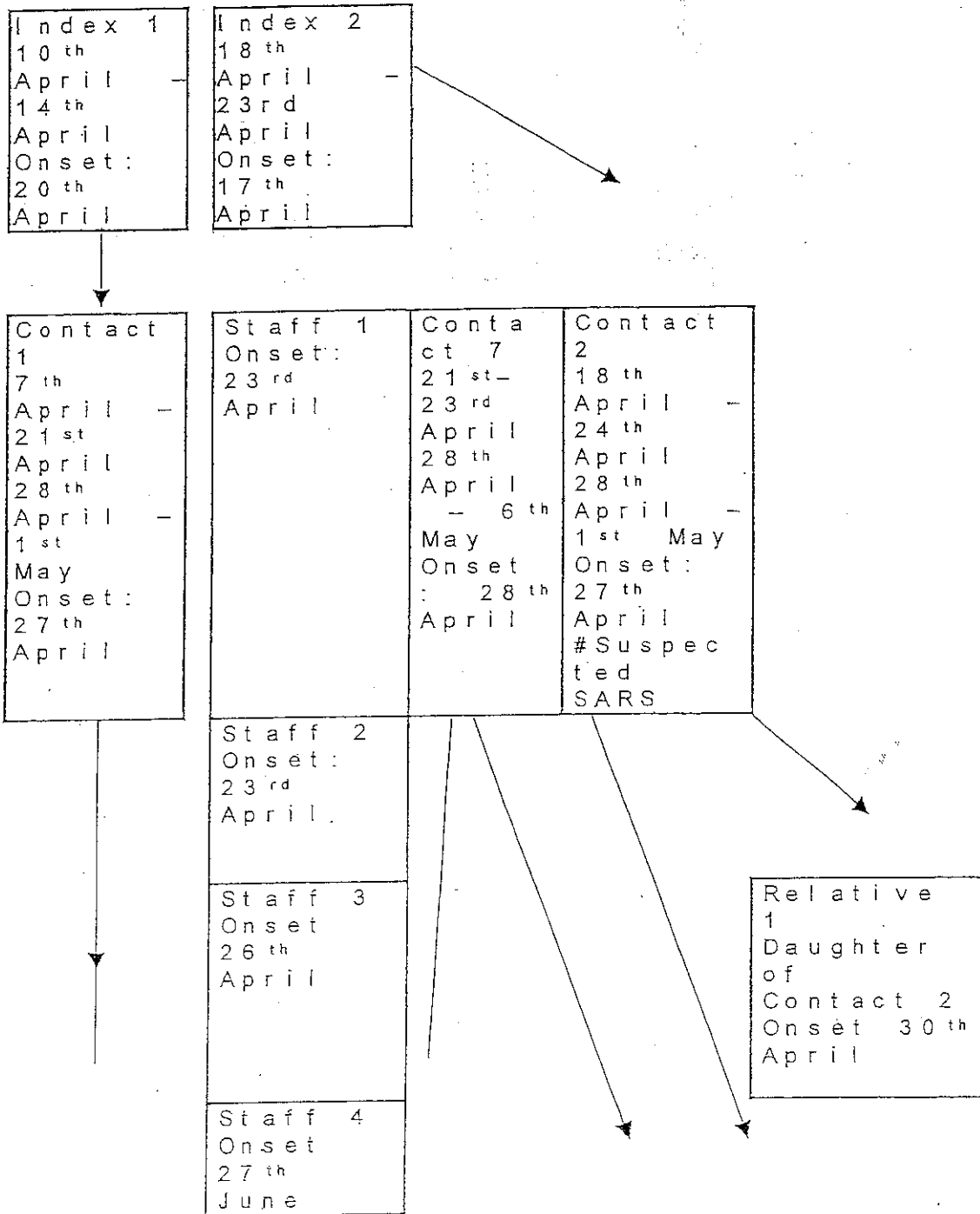
Epidemic Curve of Cluster of SARS Cases in C8



There is no further case since 19<sup>th</sup> May, 2003 (Onset date)

Appendix 3:

Pathway of the Spread of Infection from 2 Index Cases



Staff 5 Onset 3 <sup>rd</sup> May	Contact 3 (28 <sup>th</sup> April - 5 <sup>th</sup> May) Onset: 6 <sup>th</sup> May	Contact 4 25 <sup>th</sup> April - 5 <sup>th</sup> May Onset: 5 <sup>th</sup> May
Conta ct 5 28 <sup>th</sup> April - 5 <sup>th</sup> May Onset 5 <sup>th</sup> May	Contact 6 28 <sup>th</sup> April - 5 <sup>th</sup> May Onset 7 <sup>th</sup> May	

Contact 10 23 <sup>rd</sup> April - 6 <sup>th</sup> May Onset 14 <sup>th</sup> May	Contact 12 26 <sup>th</sup> April - 6 <sup>th</sup> May Onset 15 <sup>th</sup> May	Conta ct 9 28 <sup>th</sup> April - 5 <sup>th</sup> May Onset 13 <sup>th</sup> May	Contact 13 29 <sup>th</sup> April - 5 <sup>th</sup> May Onset 19 <sup>th</sup> May
--	--	--	--

Legend:  
Case  
Code  
Period  
in C8