SARI CRITICAL CARE TRAINING

SEVERE ACUTE RESPIRATORY INFECTION (SARI) TREATMENT FACILITY DESIGN

MODULE 3: REPURPOSING AN EXISTING BUILDING INTO A SARI TREATMENT CENTRE [STC]

MARCH 2020
Learning objectives

By the end of this lecture, you will be able to:

• Assess and evaluate available existing structures;

• Identify key and essential structural elements; and

• Describe how to adapt an existing building into a SARI treatment centre.
Modules

This lecture is organized in two different sections:

• 3A Basic design principle

• 3B Existing building selection.
Module 3A

Basic design principle
Basic design principles

There are some essential features a SARI treatment centre must have.

These essential design elements are:

- Accesses and flows
- Space allocation (mixed areas and restricted areas)
- Proximity between areas
- Dimensions and distances
- Ventilation and light
- Materials.

NOTE: Expected bed capacity should lead the building selection process!!!
Essential structural elements

Essential elements:

- Patient’s entrance area: reception, waiting room, patient’s toilet and triage, sampling.
Essential structural elements

Essential elements:

• Patient’s entrance area: reception, waiting room, patient’s toilet and triage, sampling.

• Staff’s area: entrance, changing room, staff’s toilet, office, logistic area.
Essential structural elements

Essential elements:

• Patient’s entrance area: reception, waiting room, patient’s toilet and triage, sampling.

• Staff’s area: entrance, changing room, staff’s toilet, office, logistic area.

• Ward: Mild/moderate, severe and critical wards
Two main flows:

- **Patient flow**: Patients who present symptoms access the facility.
Accesses and flows

Two main flows:

• Patient flow: Patients who present symptoms access the facility.

• Staff flow: After the temperature screening, staff can move from staff area to triage, reception or wards.
Space allocation

Two main areas:

Have two separate areas, one mixed for staff and patients, and the other one for staff only. This reduces the risk of infection for HCW, and allows a rationalized used of PPE, leading to a significant reduction in consumption and providing a safe place for staff to rest.
Proximity between areas

Some areas need to be in proximity:

Some spaces have to be close to each other with a determined spatial arrangement in order to ensure a proper flow, both for patients and staff.

A clear example is the patient’s entrance complex composed of the reception, waiting room, and triage [patient’s and staff’s side].
Surfaces, distances and openings

Spatial separation

Some spaces, such as the waiting room, screening, triage and mild/moderate wards, should be spacious enough to ensure two (2) meters* of spatial separation in between patients.

This distance can be enforced with the use of screens and transparent surfaces.

Two (2) meters of distance is also recommended in between suspected cases in case of a cohorting approach.

*Recommended spatial distance for IPC measures is 1 meter. However, in order to facilitate access and movement of healthcare workers, 2 meters distance is advised.
Surfaces, distances and openings

Doors, corridors and elevator dimensions

Severe and critical cases may need to be transported to their respective wards with a hospital bed.

Once possible locations for critical and severe wards have been identified, check the pathways heading to these areas to see if they are accessible with a hospital bed.

If pathways are not wide enough, check if the areas are accessible with stretchers.
# Doors, corridors and elevator dimensions

<table>
<thead>
<tr>
<th></th>
<th>Elevators and hoists</th>
<th>Corridors</th>
<th>Doors</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Minimum dimensions for hospital bed</strong></td>
<td>240 cm x 140 cm</td>
<td>240 cm</td>
<td>120 cm</td>
</tr>
<tr>
<td><strong>Minimum dimensions for stretchers</strong></td>
<td>240 cm x 100 cm</td>
<td>180 cm</td>
<td>100 cm</td>
</tr>
</tbody>
</table>

![Diagram of hospital bed and stretcher](image)
Surfaces, distances and openings

Severe and critical ward rooms

Self-contained rooms for severe and critical patients should be spacious enough to contain all the needed biomedical devices and for medical staff to stay at the bedside without issue.

Recommended surface is at least 9.6 square meters (m²).
Ventilation and light

Two different types of ventilation are required

- Natural ventilation should be assured for the waiting room, triage, mild and moderate wards, staff working area with a minimum flow rate of 60 l/s/patient.
Ventilation and light

Two different types of ventilation are required

- Natural ventilation should be assured for the waiting room, triage, mild and moderate wards, staff working area with a minimum flow rate of 60 l/s/patient.

- Hybrid ventilation should be assured for severe and critical wards. A top-down airflow moving from clean to dirty zones with a minimum flow rate of 160 l/s/patient.
Ventilation and light

Some buildings, especially high density index facilities such as sports halls, health care facilities, offices and schools, may already have mechanical ventilation.

If already available, assess the flow rate, flow direction and how the exhausted air is treated or diluted.
The recommended characteristics for finishes and furniture are:

- Cleanable (material easy cleanable and resistant to repeated cleaning)
- Easy to maintain and repair (Select materials that are durable and/or easy to repair)
- Resistant to microbial growth (Select metals and hard plastics)
- Nonporous (Avoid porous plastics, such as polypropylene, in patient care area)
- Seamless (Avoid upholstered furniture in patient care areas).
Module 3B

Existing building selection
Existing buildings selection

Which buildings are suitable to be repurposed into a SARI treatment centre?

- How to identifying an existing building according to structural layout and surface;
- Key structural elements; and
- Examples.
Existing buildings selection

Surface needed

These measures are indicative and based on architectural standards and previous field experiences with other infectious diseases.
Existing buildings

Which buildings are suitable to be repurposed into a SARI treatment centre?

- Buildings with a vertical distribution (accommodation facilities such as hotels, students accommodations, schools, offices, etc.)
Existing buildings

Which buildings are suitable to be repurposed into a SARI treatment centre?

- Buildings with a vertical distribution (accommodation facilities such as hotels, students accommodations, schools, offices, etc.)
- Buildings with horizontal distribution (schools, offices, etc.)
Existing buildings

Which buildings are suitable to be repurposed into a SARI treatment centre?

- Buildings with a vertical distribution (accommodation facilities such as hotels, students accommodations, schools, offices, etc.)
- Buildings with horizontal distribution (schools, offices, etc.)
- Big open spaces (such as sport halls, trade fair pavilions, polyvalent buildings, etc.)
Vertical distribution buildings

Vertical distribution buildings, such as hospitals, residential complexes, offices or schools, are usually characterized by a similar layout reproduced on all floors with support services gathered at ground floor.

The ground floor could have a hall with a reception, big rooms for conferences, canteen, or meetings.

The other floors have one side or double sided rooms with a corridor. Bathrooms could be individual or public.
Vertical distribution buildings

**Hotel example**

- Hall
- Canteen
- Conference room
- Staff zone
- First floor rooms
- Second floor rooms
- Third floor rooms
**Vertical distribution buildings**

**Hotel example**

- Hall
- Canteen
- Conference room
- Staff zone
- First floor rooms
- Second floor rooms
- Third floor rooms

- Reception, waiting room
- Staff area, warehouse, offices
- Triage, sampling
- Staff changing room
- Critical ward
- Severe ward
- Mild and moderate ward
Horizontal distribution buildings

Horizontal distribution buildings, such as residential complex, offices or schools, usually are characterized by a central hall, offices nearby and one or more corridors. Usually corridors start from the hall.

They could also host big areas [open space] such as gymnasium or conference rooms, libraries, etc.
Horizontal distribution buildings

School example

- Hall
- Offices
- Corridor 1
- Corridor 2
- Gymnasium
- Library
Horizontal distribution buildings

School example

- Hall
- Offices
- Corridor 1
- Corridor 2
- Gymnasium
- Library

- Waiting room, reception
- Offices, triage, sampling
- Critical ward
- Severe ward
- Mild and moderate ward
- Staff area, logistic warehouse

World Health Organization
Open space buildings

This includes fair trade pavilions and sports halls such as basketball and volley courts. Usually present wide halls, offices, public bathrooms and big open and empty space such as the playfield.

Due to their layout, open space buildings could be easily adapted to temporarily isolate patients with a cohorting approach such as community facilities.

Big fair trade pavilions, due to their dimensions, are able to host the whole STC.
Open space buildings

Basketball court example for cohorting approach

- Big hall
- Offices
- Team’s changing room
- Public bathroom
- Basketball court
Open space buildings

Basketball court example for cohorting approach

- Big hall
- Offices
- Team’s changing room
- Public bathroom
- Basketball court
- Waiting room, reception
- Offices, logistic warehouse
- Staff changing room
- Patient’s bathroom
- Patients with same level of severity or corhoting

Patients with same level of severity

Public bathrooms for patients
<table>
<thead>
<tr>
<th>Building</th>
<th>Whom</th>
<th>Access requirements</th>
<th>Adjacent area</th>
<th>Minimum recommended size &amp; distances</th>
<th>Space allocation</th>
<th>Ventilation</th>
<th>Exhausted air system</th>
<th>Recommended location</th>
<th>Dedicated toilet</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reception</td>
<td>Patients</td>
<td>IN from outside, OUT forward waiting room</td>
<td>Waiting room, triage</td>
<td>5 mq</td>
<td>Staff only</td>
<td>Natural</td>
<td>Dilution</td>
<td>Ground floor</td>
<td>In staff area</td>
</tr>
<tr>
<td></td>
<td>Staff</td>
<td>IN from staff area, OUT back to staff area</td>
<td>waiting room</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Waiting</td>
<td>Patients</td>
<td>IN from reception, OUT forward triage, staff area</td>
<td>reception, triage, toilet, staff area</td>
<td>2m between patients in all directions</td>
<td>Mixed</td>
<td>Natural</td>
<td>Dilution</td>
<td>Ground floor</td>
<td>Patients only, wc and washbasin</td>
</tr>
<tr>
<td></td>
<td>Staff</td>
<td>IN from staff area, OUT to mixed area</td>
<td>staff area</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Triage</td>
<td>Patients</td>
<td>IN waiting room, OUT patient wards, staff area, sampling room</td>
<td>Waiting room, toilet, staff area</td>
<td>Transparent surface: 2 m deep x 1 m wide for patient; without: 1 m distance between patient and staff</td>
<td>Mixed</td>
<td>Natural</td>
<td>Dilution</td>
<td>Ground floor</td>
<td>Patients only, wc and washbasin</td>
</tr>
<tr>
<td></td>
<td>Staff</td>
<td>IN from staff area, OUT back to staff area</td>
<td>staff area</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sampling</td>
<td>Mixed</td>
<td>IN from mixed area, OUT back to mixed area</td>
<td>Triage, patient wards</td>
<td>9 mq, one room for each patient</td>
<td>Mixed</td>
<td>Natural</td>
<td>Dilution</td>
<td>Ground floor</td>
<td>Patients only, wc and washbasin</td>
</tr>
<tr>
<td></td>
<td>Staff</td>
<td>IN from outside</td>
<td>Staff area</td>
<td></td>
<td>Staff only</td>
<td>Natural</td>
<td>Dilution</td>
<td>Ground floor</td>
<td>In staff area</td>
</tr>
<tr>
<td>Change</td>
<td>Staff</td>
<td>IN from staff entrance, OUT forward staff area</td>
<td>Staff entrance, staff area</td>
<td></td>
<td>Staff only</td>
<td>Natural</td>
<td>Dilution</td>
<td>Ground floor</td>
<td>In staff area</td>
</tr>
<tr>
<td></td>
<td>Staff</td>
<td>IN from staff area, OUT forward staff area</td>
<td>staff area</td>
<td></td>
<td>Staff only</td>
<td>Natural</td>
<td>Dilution</td>
<td>Ground floor</td>
<td>In staff area</td>
</tr>
<tr>
<td>Offices</td>
<td>Staff</td>
<td>IN from staff area, OUT forward staff area</td>
<td>Staff area</td>
<td>According to bed capacity and estimated consumption</td>
<td>Staff only</td>
<td>Natural</td>
<td>Dilution</td>
<td>Ground floor</td>
<td>In staff area</td>
</tr>
<tr>
<td>Logistic</td>
<td>Staff</td>
<td>IN from staff area, OUT forward staff area</td>
<td>staff area, outside for goods offloading</td>
<td></td>
<td>Staff only</td>
<td>Natural</td>
<td>Dilution</td>
<td>Ground floor</td>
<td>In staff area</td>
</tr>
<tr>
<td></td>
<td>Goods</td>
<td>IN from outside</td>
<td>Staff area</td>
<td></td>
<td>Staff only</td>
<td>Natural</td>
<td>Dilution</td>
<td>Ground floor</td>
<td></td>
</tr>
<tr>
<td>Mild/Moderate case wards</td>
<td>Patients</td>
<td>IN from mixed area, OUT forward mixed area</td>
<td>Mixed area, staff area</td>
<td>2m between patients in all directions</td>
<td>Rooms: mixed</td>
<td>Natural or mechanical: 160 l/s/patient</td>
<td>1. Dilution</td>
<td>Patients toilet only</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Staff</td>
<td>IN from staff area or form mixed area, OUT forward staff area or toward mixed area</td>
<td>mixed area, staff area</td>
<td></td>
<td>Corridor: staff only</td>
<td>Natural or mechanical: 160 l/s/patient</td>
<td>2. Portable HEPA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Severe</td>
<td>Patients</td>
<td>IN from mixed area, OUT forward mixed area</td>
<td>Mixed area, staff area</td>
<td>3.5 x 3.2 meters</td>
<td>Rooms: mixed</td>
<td>Natural</td>
<td>As closed as possible to triage and critical ward</td>
<td>Patients toilet only</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Staff</td>
<td>IN from staff area or form mixed area, OUT forward staff area or toward mixed area</td>
<td>mixed area, staff area</td>
<td></td>
<td>Corridor: staff only</td>
<td>Natural or mechanical: 160 l/s/patient</td>
<td>3. HEPA + air extractors</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Critical</td>
<td>Patients</td>
<td>IN from mixed area, OUT forward mixed area</td>
<td>Mixed area, staff area</td>
<td>3.5 x 3.2 meters</td>
<td>Rooms: mixed</td>
<td>Natural</td>
<td>As closed as possible to triage</td>
<td>Patients toilet only</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Staff</td>
<td>IN from staff area or form mixed area, OUT forward staff area or toward mixed area</td>
<td>mixed area, staff area</td>
<td></td>
<td>Corridor: staff only</td>
<td>Natural or mechanical: 160 l/s/patient</td>
<td>1. Dilution</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Morgue</td>
<td>Body</td>
<td>IN from mixed area, OUT forward outside</td>
<td>Mixed area, staff area</td>
<td></td>
<td></td>
<td></td>
<td>Natural</td>
<td>Dilution</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Staff</td>
<td>IN from staff area or form mixed area, OUT forward staff area or toward mixed area</td>
<td>mixed area, staff area</td>
<td></td>
<td></td>
<td></td>
<td>Natural</td>
<td>Dilution</td>
<td></td>
</tr>
</tbody>
</table>
Step by step design

The building to be repurposed has been identified

Necessary prerequisites to start the design process:

- Be sure to have all the technical drawings, plans of the existing building.
- Be sure to have plans and technical specifications for:
  - Ventilation,
  - Plumbing,
  - Electrical systems.
Step by step design

Design phases:

- Identify existing accesses and building distribution system. Try to find out two different main accesses: one for patients and one for staff, as shown in this presentation.
- Considering dimensions, proximity and flows, try to assign STC areas to existing areas.
- Check if electrical, ventilation and plumbing systems and waste management are appropriate for STC.
- Check if emergency pathways and doors are correct also according to the new layout.
- Decide which kinds of interventions you need to adapt the existing buildings to STC requirements.
Step by step design

Design phases:

- Identify existing accesses and building distribution system. Try to find out two different main accesses: one for patients and one for staff, as shown in this presentation.
Step by step design

Design phases:

- Considering dimensions, proximity and flows, try to assign specific COVID-19 areas to existing areas.
Step by step design

Design phases:

- Check if electrical, ventilation, plumbing systems and waste management are appropriate for the repurposing.
Step by step design

Design phases:

- Check if emergency pathways and doors are still accessible according to the new layout.
Step by step design

Design phases:

- Project the intervention to repurpose the existing buildings.
Helpdesk

For further information and to share your proposal for feedbacks, please contact us:

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Thank you

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