INFE X BLOC™

Addressing the Complex Ecosystem of Senior Care

The residents of senior care communities represent just 0.6% of the population yet have so far accounted for 42%[1] of deaths due to coronavirus in our country. And headlines proclaiming these sad facts are creating a rapidly emerging trust deficit, which if not addressed could easily have long-term effects on the industry as a whole. Yet, in order to overcome the weaknesses of the system that led to the uncontrolled harm, we must first understand the nature of the hazard we face.

A Complex Ecosystem

First, it's important to note that the operational ecosystem of a Senior Care facility (licensed by the Department of Social Services in California as "RCFE"), as depicted in Figure 1, is complex. There are several external entities that come in contact with these facilities and almost all of these are in multiples (many pharmacies, many doctors, many hospitals, etc.), and they interact with the facility multiple times every day.

This implies that the attack surface area (a terminology from the cyber security domain that references the size and shape of the zone that exposes vulnerability) that facilities must be concerned with, is therefore very large. As the number of licensed beds increases, so does this attack surface area.

While some industries can feel good of the automatic benefits of remote working, Senior Care facilities will continue to be a hi-touch industry.

While there will be opportunities to use remote examination via tele-health-visits, the bulk of caregiving will remain hi-touch, requiring physical contact.
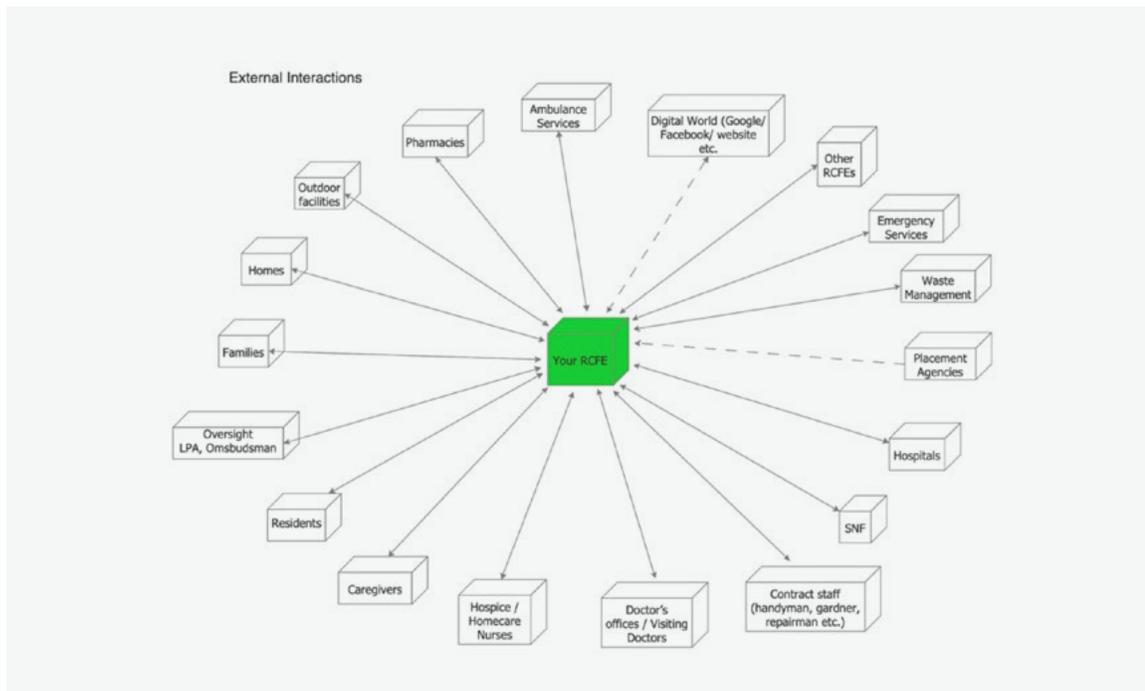

Figure 1: *A complex operational ecosystem*

Understanding the Exposure

If we dig deeper to understand a facility's level of exposure, we find that we can think of it in three parts:

- From the outside-in
- When the bug is already inside
- Transmission pathways
    - Via surface contact
    - Via aerial pathway

Each of the above exposure categories can result in an infection to a once healthy senior.

From Outside

Every interaction with the outside world represents an infection transmission vector – a pathway along which infection can travel. In Figure 1, all solid lines are possible attack vectors via which the infection can arrive, only the dotted lines represent interfaces that are not involved in possible infection transmission.

The number of ways in which infection can come from outside is:

$$(\text{number of residents}) \ \text{x} \ (\text{number of visitation events from outside})$$

This grows geometrically as the bed capacity increases.

When the Bug is Inside

To go deeper, Figure 2 represents the interactions between the insiders. On the inside, we have two types of actors:

- Human (residents, caregivers, visiting professionals, staff, contract workers, family members, etc.).

- Non-human (care equipment like wheelchairs and walkers, cleaning equipment, faucets, doorknobs, etc., which once contaminated with a bacteria or virus can lead to spread).
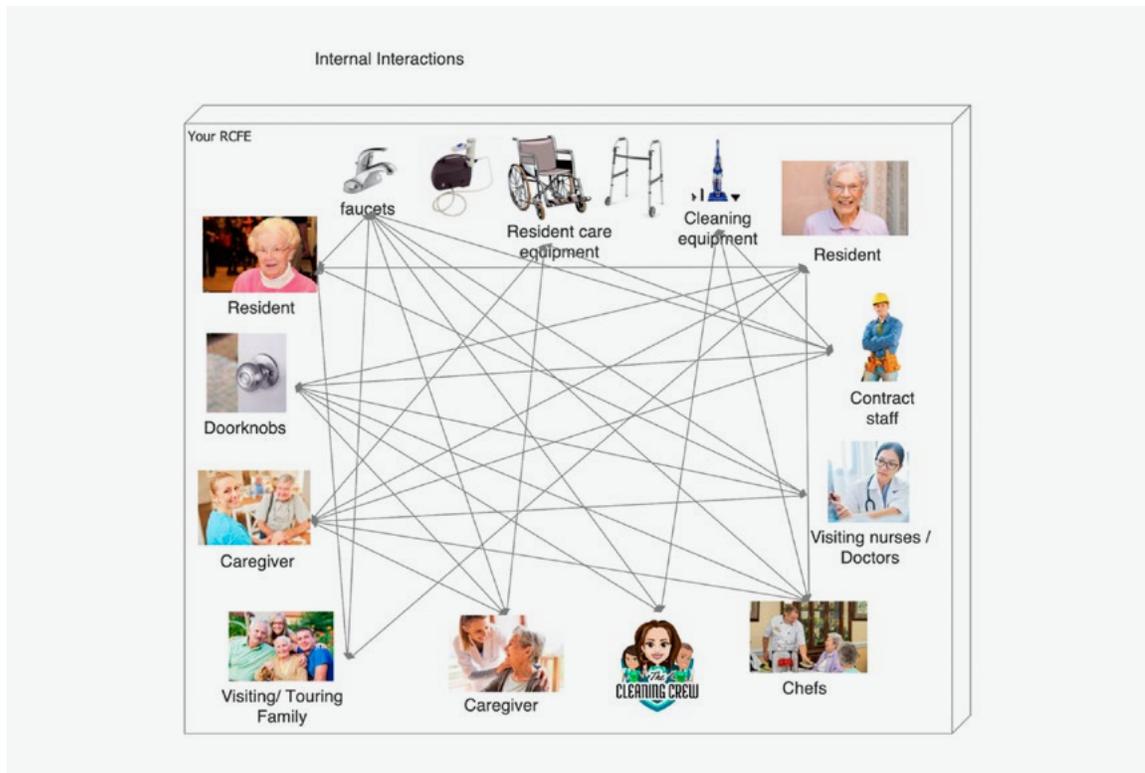
Figure 2: *The complexity multiplies on the inside*

Every interaction line in Figure 2 represents another infection transmission vector and like before, each entity is in multiples (many residents, many caregivers, many non-care providing staff, many visiting professionals, many visiting relatives, many wheelchairs, many doorknobs, many faucets, etc.). Inside the Senior Care facility, the attack surface area grows exponentially.

The Aerial Pathway

In an eye-opening simulation[2] (Figure 3) of infection spread, the aftermath of an infectious person coughing in a grocery store aisle was presented.

In this time-lapse, we see the droplet-cloud spread via the aerial pathway. In this case, no contact disinfection methods (disinfectant sprays, wiping surfaces, UV lights, etc.) may be effective.

The issue is further compounded by the fact that in closed spaces, like in a Senior Care facility, the HVAC system, which is traditionally not designed to disinfect, recirculates air. Theoretically, this makes the attack surface area hyper large and any human actor can be the source, with anyone in the vicinity becoming a target.

Figure 3: *The Aerial Route*

1. Ground zero of Coronavirus https://www.forbes.com/sites/theapothecary/2020/05/26/nursing-homes-assisted-living-facilities-0-6-of-the-u-s-population-43-of-u-s-covid-19-deaths/#9cd470374cdb

Additionally, the latest headlines from WHO claim that data exists that Coronavirus is airborne (Figure 4). While we do not have much data about this aerial infection spread, it suffices to say that this dramatically increases the attack surface area needing defense.

Telemetry of the Spread

Because of all of these factors, in order to protect our residents, we must use a system which takes into account the telemetry of spread. One example of telemetry is how scientists track the movement of whales in ocean documentaries. Telemetry can also be used to track the spread of infectious viruses and bacteria.

Using telemetric methods, if one were to track the sequence of:

- door handles touched to enter the resident room,

- the equipment touched (walkers, wheelchairs, breathing oxygen tubes, CPAP masks, etc.),

- the body contact during caregiving events (incontinence care, toileting, bathing, tooth brushing, etc.),

- meals delivery (food plates, bowls, delivery presentation, milk pouring, etc.) as well as post-meal cleanup activity,

we could theoretically arrive at the detailed telemetry of the infection spread.

An eye-opening (and scary) video[3], compiled by CNN, showed a black light simulation (Figure 5) of a dinner table setting and how quickly and completely germs can spread in a short time.

When you translate the results of this simulation to the senior care community, it's

Figure 4: *WHO claims Coronavirus is airborne!*

easy to see how quickly a virus can move from one resident, staff member, or surface to the next.

Enhancing Safety in a Complex Ecosystem

This means that in order for the senior care community to enhance safety and regain trust in this post-pandemic world, we must put systems in place that address the needs of this complex ecosystem and the multiple points of transmission involved in spreading the infection.

The InfeXBloc™ architecture was created to do exactly that, by introducing multiple barriers between the hazard and the residents and caregivers and moving communities from an implicit trust model that assumes

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2. Simulation of Coronavirus infection traveling in the air across grocery store aisles https://www.youtube.com/watch?v=md6G2hqrhBE

3. Blacklight simulation https://www.youtube.com/watch?v=MMwYsGews-8
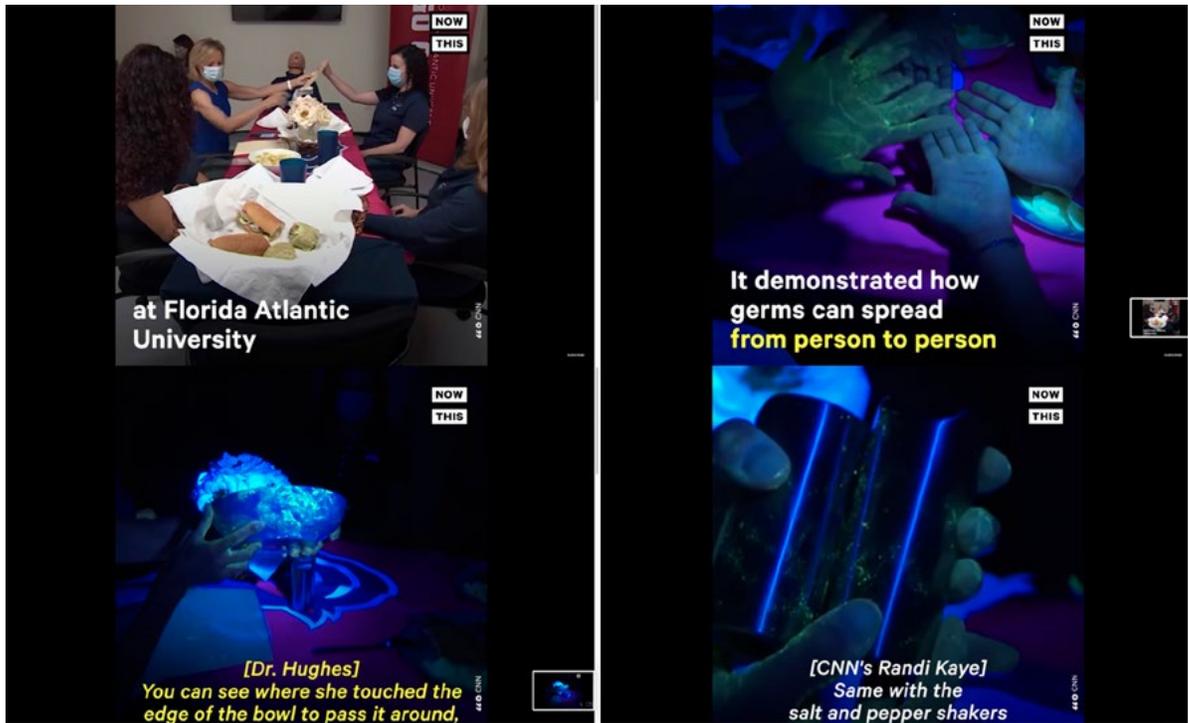
Figure 5: *Black light simulation of spread telemetry*

safety from a virus until proven otherwise, to a proven-trust model, which assumes danger until proven safe. When adopted, not only will InfeXBloc™ help facilities resist further pandemic waves, but also improve the care our facilities can offer to our residents.

We may never get to zero transmission vectors because of an overwhelming presence of human interactions (which are prone to unconscious errors), but we must endeavor to lower the transmission risk.

To learn more about how the InfeXBloc™ architecture can help your Senior Care facility regain trust after the COVID-19 storm, by addressing the needs of the complex senior care ecosystem, check out www.infexbloc.com.

INFE X BLOC™

Golden Springs Ranch

About Ashish Warudkar

Ashish has worked in the software industry for 30+ years including 19+ years in the healthcare sector. He also has been an entrepreneur for over two decades and provides consultation to "Golden Springs Ranch" which is an upcoming InfeXBloc™ home in Palmdale, California which will introduce the innovations discussed in this paper to provide its precious residents with a safe happy home and their families with peace of mind.

Ashish Warudkar is trained at:

IIT Bombay	Mechanical Engineering
UCI	Predictive Analytics (7/8)
Harvard	Disruptive Innovation Strategy with Clayton Christensen
MIT	Advanced Certificate for Executives in Management, Innovation & Technology
	Architecture & Systems Engineering of Complex Systems
	Platform Strategy – Building & Thriving A Vibrant Ecosystem
	Business Dynamics – Diagnosing and Solving Complex Business Problems
	Executive Certificate in Strategy and Innovation
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