



COLLOQUE IRSST 2021

La recherche en SST
au service des milieux du travail
en période de pandémie

Uniformes médicaux connectés au service de la logistique et
de la prévention de contamination en période de pandémie

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Vos conférenciers



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Où nous en sommes



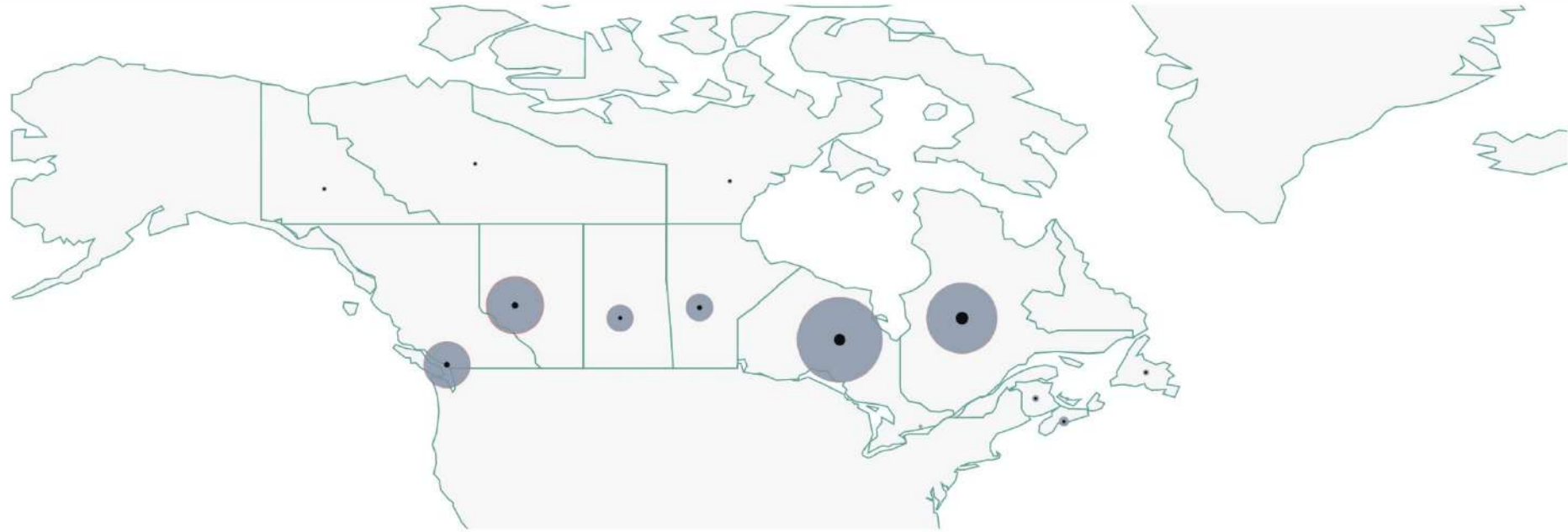
Absol. No.
 Per 100,000 ppl.

WORLD

CANADA

Provinces/Terr. Number of cases ↓

Canada	1,535,364
Ontario	572,978
Quebec	396,034
Alberta	264,564
British Columbia	172,338
Manitoba	59,203
Saskatchewan	57,521
Nova Scotia	6,117
New Brunswick	2,909
Newfoundland and Labr.	1,532
Yukon	699
Nunavut	658
Northwest Territories	563
Prince Edward Island	235



Canada | Most recent numbers

	REPORTED CASES	COMPARED TO PREVIOUS DAY
Infected	1,535,364	+ 1,876
Active*	38,497	+ 348
Recov.	1,469,717	+ 1,512
Deaths	27,150	+ 16

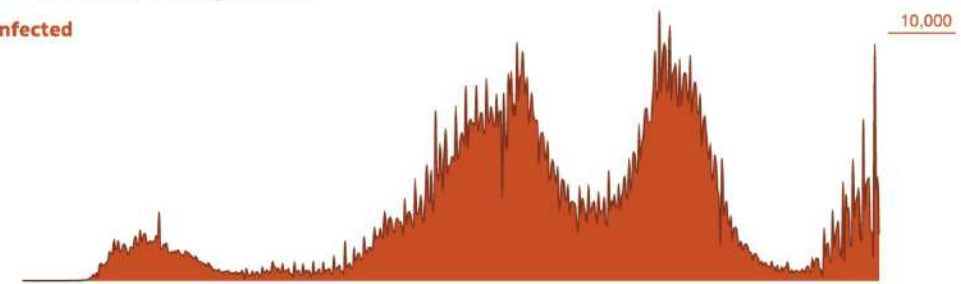
*infected people who have neither died nor been officially considered recovered

<https://ici.radio-canada.ca/info/2020/coronavirus-covid-19-pandemie-cas-carte-maladie-symptomes-propagation/>

Canada | Reported daily cases

Cumulative
 Logarithmic

Infected



Recovered



Évolution du contexte - avant



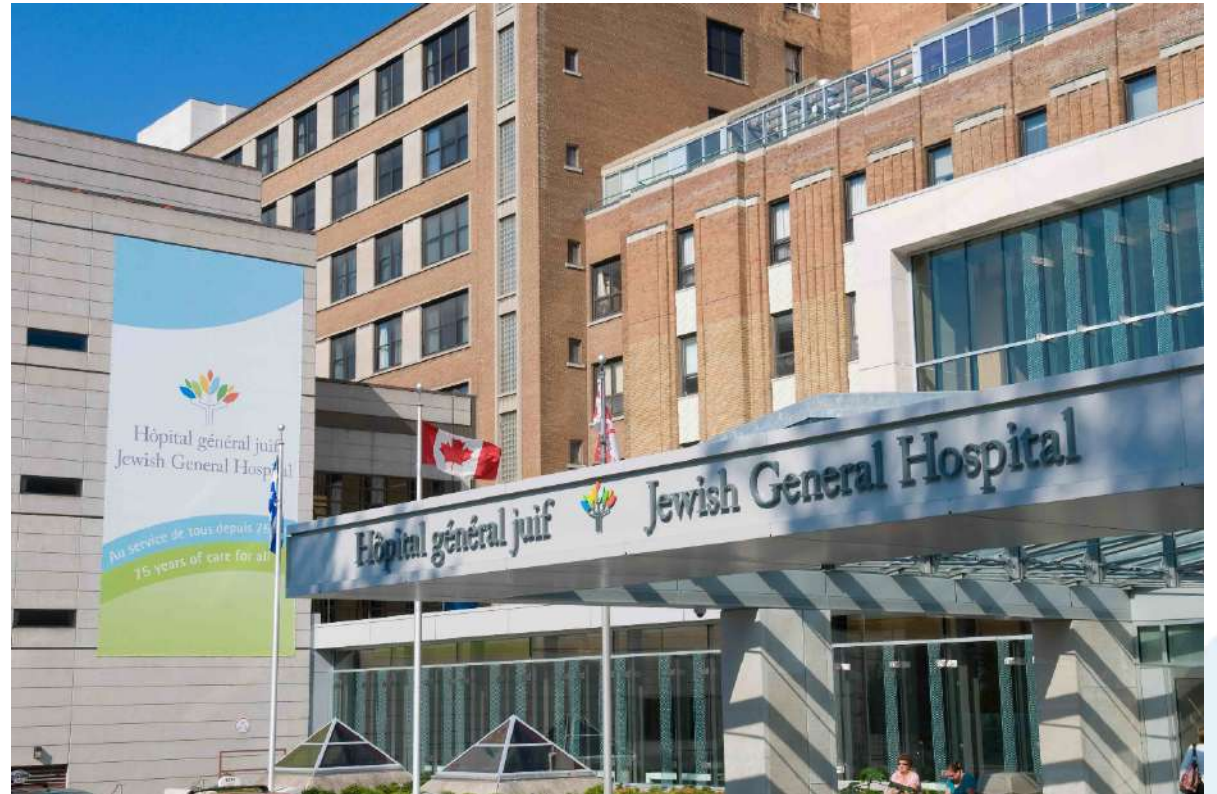
Évolution du contexte...et maintenant



Les défis & enjeux - le cas de l'HGJ (notre partenaire dans le projet)

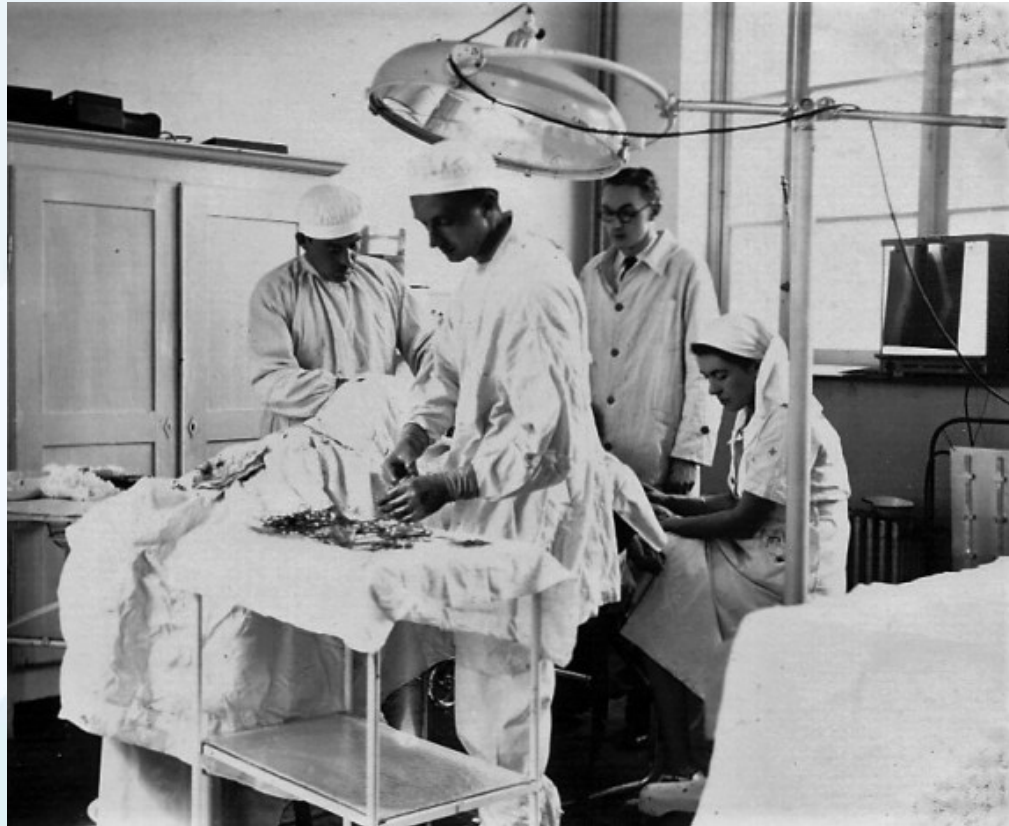


Les défis sont multiples, il faut concilier efficacité des opérations et expérience patient-famille, réfléchir à la circulation des patients, du personnel et de l'équipement dans un environnement de travail très exigeant.



Co-évolutions du secteur et des technologies

Ubiquité des technologies (Robots) & des objets connectés



Défis & Opportunités d'amélioration en SST

...par où on commence?

- Administration
- Adult Critical Care
- Allergy And Immunology
- Ambulatory recovery room
- Anaesthesia - Resuscitation
- Audio-Visual Services
- Audiology & Speech Pathology
- Auxiliary
- B'rith Room
- Biomedical Engineering
- Breast Centre
- Cancer Prevention Centre
- Cardiac Surgery
- Cardiology
- Cardiovascular Prevention Center
- Case room
- Central Sterilization Departement
- Centre for Nursing Research
- Chaplaincy
- Clinical Chemistry
- Clinical Research Unit
- Coffee Shops - Atrium
- Colposcopy
- Conference Rooms
- Continus Quality Improvement CQI
- Council of Physicians, Dentists and Pharm
- Dentistry
- Dermatology
- Diagnostic Medecine
- Dialysis
- Dietetics
- Emergency
- Employee Assistance Program
- Endocrinology
- Epidemiology
- Family Birthing Centre
- Finance
- Foundation
- Gastroenterology
- Geriatrics
- Health Sciences Llibrary
- Health Services
- Health & Safety
- Hematology
- Herzl Family Practice Center
- Hope & Cope
- Hospital Training and Staff Development
- Housekeeping
- Human Resources
- Infection Prevention and Control
- Information Technologies
- Intalation Respiratory
- Institute Of Community And Family Psychiatry
- Intensive Care Unit
- Internal Medicine
- Kidney Treatment Center
- Lady Davis Institute For Medical Research
- Laundry And Linen Services
- Mail Room
- Main Lobby
- Maintenance and Plant Operations
- Maison de la Presse
- Medical council
- Medical Day Hospital
- Medical Genetics
- Medical Records
- Medical Teaching Office
- Medicine
- MHA Medical Holding Area
- Microbiologie and infectious diseases
- Montreal Centre for Experimental Therapeut
- MSTU Medical Short Term Unit
- Neonatology
- Nephrology
- Neurology
- Neurosurgery
- Nuclear Medicine
- Nursing
- Nursing Research
- Obstetrical Ultra Sound
- Obstetrics & Gynecology
- Occupational Therapy
- Oncology
- Operating Room
- Ophtalmology
- Orthopedics
- Otolaryngology
- Palliative Care
- Pastoral Services
- Pathology
- Pharmacy
- Physiotherapy
- Plant Operations
- Plastic and Reconstructive Surgery
- Professional Services
- Psychiatry
- Psycho-geriatric
- Public Affairs and Communications
- Pulmonary
- Pulmonary Oncology
- Purchasing
- Quality Program
- Radiation Oncology
- Radiology
- Receiving & Shipping
- Recovery Room
- Research Ethics Office
- Respiratory Physiology
- Respiratory Therapy
- Rheumatology
- Second Cup, Légaré Entrance
- Second Cup, Main Lobby
- Security
- Social Services
- Speech Pathology
- Sterilization and Distribution Se
- Surgery
- Surgical Teaching Office
- Telecommunications
- Television Service
- Thoracic Surgery
- Transfusion Service
- Ultrasound
- Undergraduate Teaching Office
- Urology
- Vascular Surgery
- Volunteer Services

Où tous regardent

Santé numérique - *Digital Health*



accenture

DIGITAL HEALTH TECHNOLOGY VISION 2020

How leaders are amplifying digital value in the wake of COVID-19

July 2020



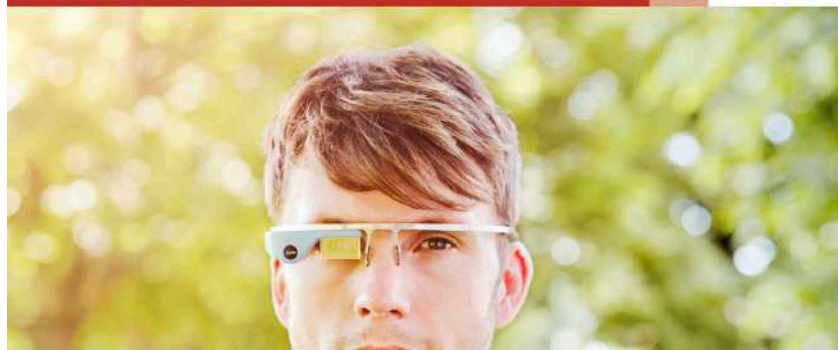
Deloitte.

Connected health
How digital technology is transforming health and social care

Deloitte Centre for Health Solutions

The Wearable Life 2.0
Connected living in a wearable world

Consumer Intelligence Series



Deloitte. Insights

A report from the Deloitte Center for Health Solutions



Digital health technology

Global case studies of health care transformation

Où peu regardent la logistique Hospitalière



MANAGEMENT Article web 0,00 \$

LA LOGISTIQUE HOSPITALIÈRE : CONSTATS D'UNE ENQUÊTE QUÉBÉCOISE

Par Pôle Santé HEC Montréal, Martin Beaulieu, Jacques Roy | Catégorie reliée: Santé



CAIRN.INFO MATIÈRES À RÉFLEXION

Vos mots-clés

REVUES | **OUVRAGES** | QUE SAIS-JE? / REPÈRES | MAGAZINES | MON CAIRN.INFO

ACCUEIL > REVUES > REVUE > NUMÉRO > ARTICLE

Logistique hospitalière, un outil du management
Le cas des hôpitaux français et moldaves
Maria Costin
DANS **HUMANISME ET ENTREPRISE** 2010/4 (n° 299), PAGES 29 À 48

CITER OU EXPORTER
AJOUTER À MA BIBLIOGRAPHIE

ARTICLE | RÉSUMÉ | PLAN | BIBLIOGRAPHIE | AUTEUR | SUR UN SUJET PROCHE | TÉLÉCHARGER

Cas d'étude

Les EPI_PPE (gestion des scrubs)

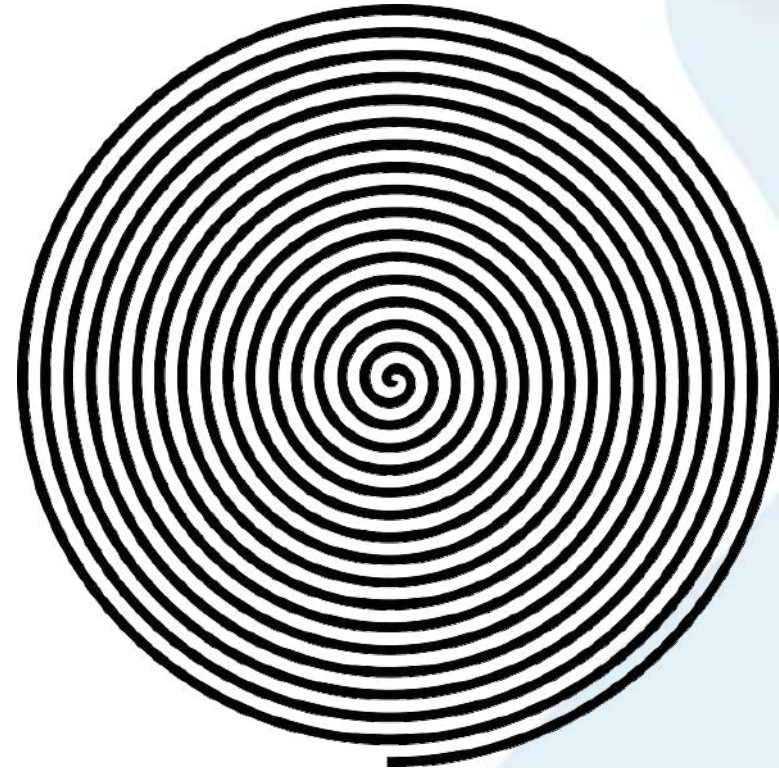


Problème d'affaire:

- inefficiences logistiques (surstockage, pénurie, vols)
- contamination croisées (règles sanitaires non respectées)
- Santé-sécurité du personnel et des patients

Cas d'étude

les problèmes classiques



Analyse du processus

et c'est tout le circuit logistique qu'il faut revoir et stabiliser...



Et puis...

il faut aussi regarder l'aspect SST

The Centers for Disease Control and Prevention (CDC) says that, although this is not thought to be the main way in which the virus spreads, a person can become infected by touching a surface that has the virus on it "and then touching their own mouth, nose, or possibly their eyes."

Dans la littérature

Nurses' uniforms: How many bacteria do they carry after one shift?

This pilot study investigated the pathogens that nurses are potentially bringing into the public and their home when they wear work uniforms outside of the work environment. To achieve this, sterilized uniforms were distributed to 10 nurses at a local hospital in Washington State at the beginning of their shift. Worn uniforms were collected at the end of the shifts and sent to a laboratory for analysis. Four tests were conducted: 1) a heterotrophic growth plate count, 2) methicillin-resistant *Staphylococcus aureus* (MRSA) growth, 3) vancomycin-resistant *Enterococci* (VRE), and 4) identification of the heterotrophic plate counts. Each participant completed a questionnaire and a survey. **The results showed that the average bacteria colony growth per square inch was 1,246 and 5,795 for day and night shift,** respectively. After 48 h, MRSA positives were present on 4 of the day shift and 3 of the night shift uniforms. Additional bacteria identified include: *Bacillus* sp., *Micrococcus luteus*, *Staphylococcus aureus*, *Staphylococcus epidermidis*, and *Micrococcus roseus*. The significant presence of bacteria on the uniforms 48 h after the shift ended necessitates further study, discussions and policy consideration regarding wearing health care uniforms outside of the work environment.

Keywords: Scrubs, uniforms, infections, nurses, healthcare providers, pathogens

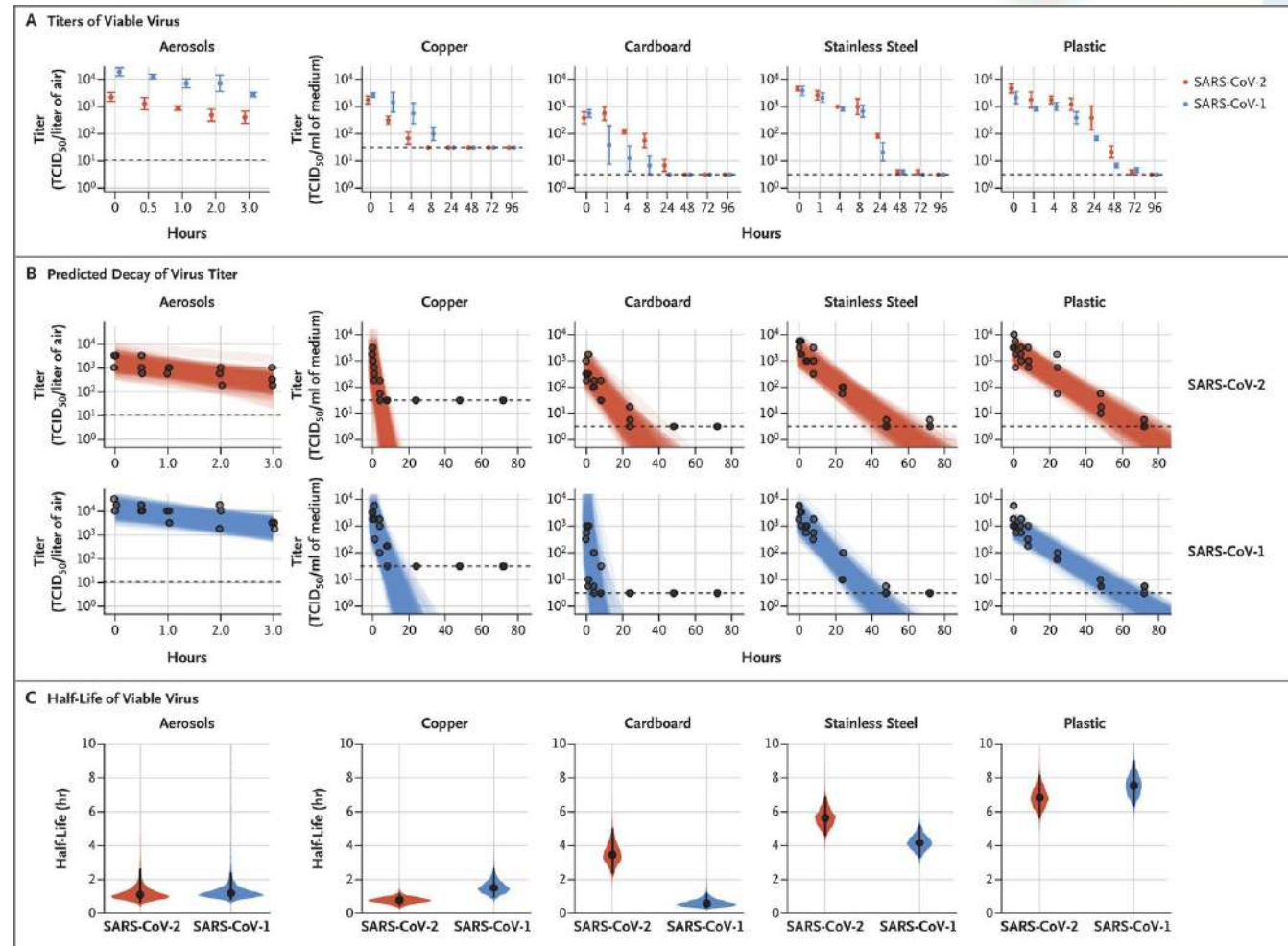
Dans la littérature
virus sur les surfaces

Aerosol and Surface Stability of SARS-CoV-2 as Compared with SARS-CoV-1

... «the virus can remain viable and infectious in aerosols for hours and on surfaces up to days (depending on the inoculum shed».



The NEW ENGLAND
JOURNAL of MEDICINE



Cas d'étude

Les EPI_PPE (gestion des scrubs)



Objectifs du projet:

- Améliorer l'efficiences des de gestion des scrubs (cycle logistique)
- Améliorer la santé-sécurité du personnel et des patient

Technologies IoT sélectionnées:

- IoT en fonction du cas d'utilisation

Cas d'étude

Les EPI_PPE (gestion des scrubs)



Les pistes de solutions
Sensibilisation,
surveillance, contrôle...
Vs.
vêtements connectés,
Armoires intelligentes,
Réapprovisionnements
automatisés,

Solutions évisagées

il existe des solutions depuis plus de 15 ans...mais

La RFID remplace le code à barres dans la blanchisserie hospitalière

RÉDACTION L'USINE NOUVELLE 25/10/2006

Keep scrubs in your hospital

HEALTHCARE SECURITY WEEKLY, March 14, 2004

Last week a Canadian hospital fed up with an estimated \$300,000 loss in stolen scrub suits decided to sell the ultra comfortable hospital uniforms. The hospital hopes to recoup the money in stolen and misplaced scrubs, according to the Calgary Herald.

Tagsys Unveils Smart Cabinet to Help Hospitals Manage Surgical Scrubs

RFID Journal Jun 13, 2007

The system takes inventory of available items, records which garments have been dispensed to which hospital staff and documents those returned for laundering.

RFID Tidies Up Distribution of Hospital Scrubs

RFID Journal Feb 06, 2007

At St. Olavs, an RFID-based system tracks work garments, saving space and labor costs while improving inventory accuracy.

Et puis...pourquoi se casser la tête Modèles de VMI & Solution jetables!



SOLUTION COMPONENTS



Solutions...distributrices/armoires



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Convenient Solutions.

HOW IDS CAN HELP YOU



SCRUBYRAK

Savings Calculator

COLLOQUE
IRSST
2021



On regarde les solutions déployées ailleurs



LARGE VOLUME DISPENSER & RECEIVER
Serves up to 170 users per day



MEDIUM COMBINATION
Serves up to 85 users per day



SMALL COMBINATION
Serves up to 40 users per day



JACKETS
Available in all three sizes

...et on se rend vite compte de la multiplicité des acteurs et des solutions

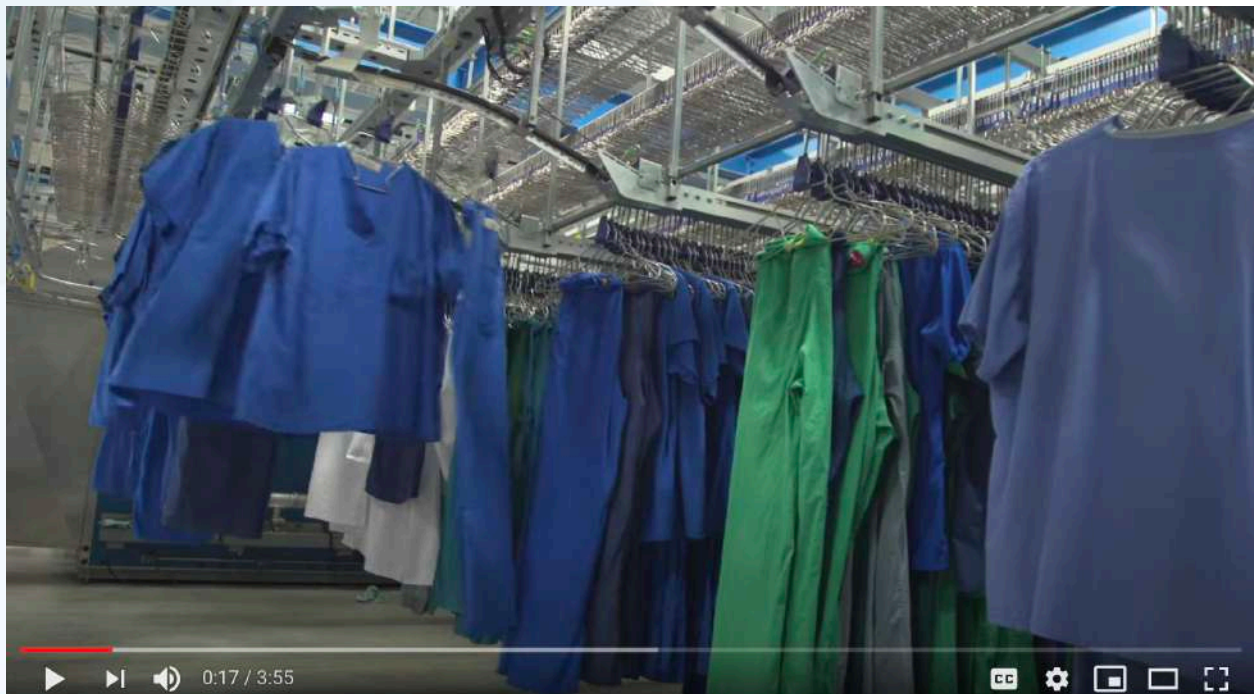


<https://www.autovaletsystems.com/>



<http://fr.deister.com/solutions/gestion-des-textiles>

...on s'intéresse à l'intégration avec les système de distribution & de la logistique de réapprovisionnement



Unitex Automated Scrub Dispensing Program & ScrbEx (2016)

On regarde ce qui se fait ailleurs



<https://www.invotech.com/products/uniform-system>

On regarde les différents modèles d'affaires

Mobilité & simplicité, mais...



scrubTraxKUMCIR (C4369)

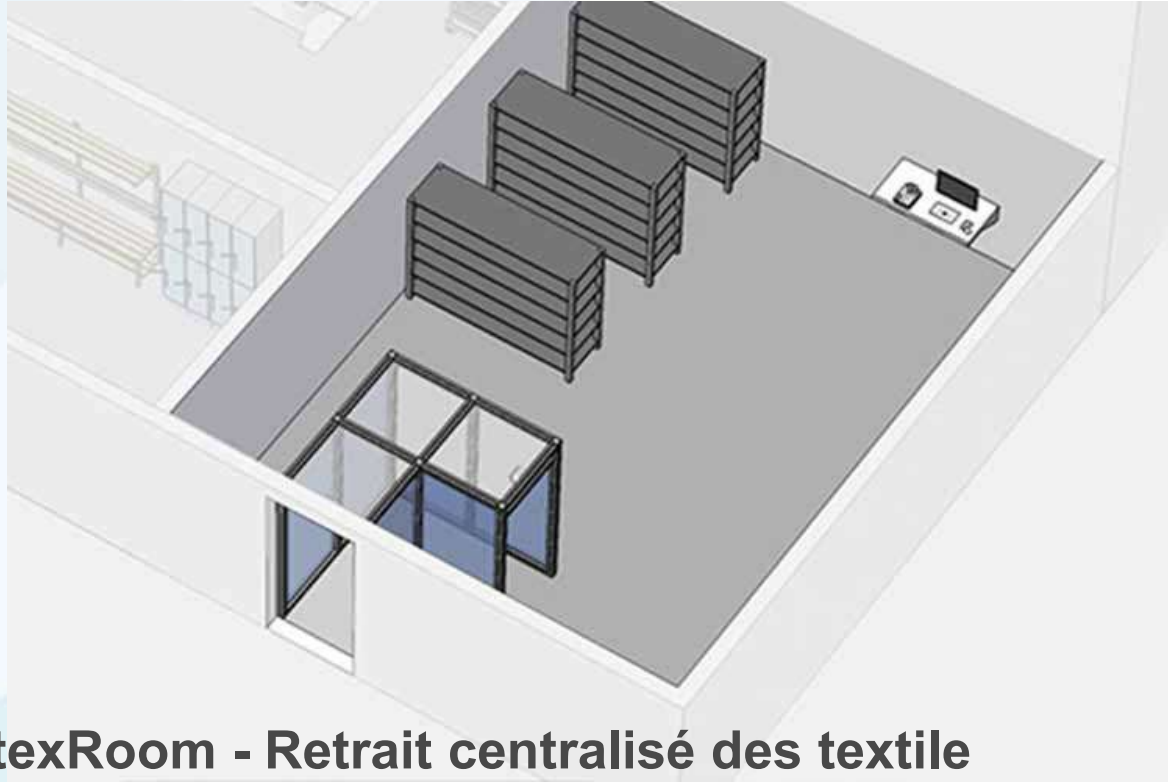
[Reports](#)
[Expand](#)
[Inventory Type Usage](#)
[Re-Sort](#)
[Send](#)

Checked Out From: * Through: * Location: *

	Checked Out	Returned	Net
Scrub Top XS	129	128	1
Scrub Top SM	269	266	12
Scrub Top MD	365	347	18
Scrub Top LG	316	304	12
Scrub Top XL	59	59	0
Scrub Top 2XL	2	2	0
Scrub Pant XS	80	80	0
Scrub Pant SM	244	233	11
Scrub Pant MD	554	532	22
Scrub Pant LG	204	199	5
Scrub Pant XL	45	45	0
Jacket 3XL	1	1	0
Jacket XS	9	9	0
Jacket SM	36	36	0
Jacket MD	30	30	0
Jacket LG	52	50	2
Jacket XL	0	0	0
Totals	2403	2320	83

Check Out, Return, Easy!

On regarde les différents modèles d'affaires
On pense aux «smat stores»



texRoom - Retrait centralisé des textile

**Le texCheck est une station
d'enregistrement manuel des
textiles par l'utilisateur.**



**La transferGate est un sas
de lectures des textiles
équipés de tags RFID.**

Cas d'étude

Les EPI_PPE (gestion des scrubs)



L'analyse des options
Expérimentation en
laboratoire & simulation

Les travaux au lab. IoT

Prototypes d'armoires connectées



Les travaux au lab. IoT

Prototypes zones connectées



Tag ID	Type	Last Seen	X (ft)	Y (ft)
e28011606000020d3f040006	Scrub1	5/22 21:57:34	4.41	-0.57
e28011606000020d3f040005	Scrub2	5/22 21:57:33	4.08	-0.39
e28011606000020d3f040004	Scrub3	5/22 21:57:31	3.47	-0.93
e28011606000020d3f040001	Scrub4	5/22 21:57:34	1.55	-0.66

Showing: 1 to 24 of 24 F

RFC OS - Beta | Home | Regions | Antennas | Tag Blink | System Errors | Admin | Hello admin

Region To Monitor: IoT_Smart_Store

Selected EPC: E20042015E806014007D377C

Epc Filter: [Empty]

Color Coding: Show tag locations

Antenna 2
E28011606000020D3F040006
Zone: Zone 2
Antenna(s): Antenna2
Confidence: 0.79

Antenna 1
E20042015E806014007D377C
Zone: Zone 1
Antenna(s): Antenna1
Confidence: 0.45

L'approche d'évaluation des options

La simulation



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Healthcare Simulation Software

The healthcare industry is undergoing significant changes. Controlling costs, responding to new regulations and enhancing patient experience are just some of the areas that benefit from predictive modeling in healthcare.

Arena is the leading healthcare simulation software solution on the market, and is currently used in hundreds of hospitals in over 20 different countries. Healthcare providers around the globe utilize Arena to study patient flow, staffing requirements, optimize use of facilities, streamlining of ER and admission processes, facilities planning and more.

- [Learn More About Hospital Patient Flow Simulation](#)
- [Learn More About Emergency Medicine Simulation](#)

<https://www.arenasimulation.com/>

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<https://www.anylogic.fr/>

anylogic

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Simulation AnyLogic

Prendre des décisions intelligentes

AnyLogic est le leader des logiciels de simulation pour les applications professionnelles et il est utilisé dans le monde entier par 40 % des entreprises du classement Fortune 100. Les modèles AnyLogic permettent aux analystes, ingénieurs et responsables d'obtenir des renseignements plus précis et d'optimiser des systèmes et des processus complexes dans un grand nombre de secteurs.

[EN APPRENDRE D'AVANTAGE](#)

La simulation

On modélise en fonction de l'environnement d'affaires

The screenshot displays a simulation software interface for modeling a hospital environment. The main workspace shows a floor plan with five distinct zones highlighted in different colors:

- ZONE ARMOIRES** (Blue)
- ZONE POST OP** (Yellow)
- ZONE RESSOURCES** (Light Blue)
- ZONE ÉVAL.** (Grey)
- ZONE STERILE** (Green)

The interface includes a menu bar (File, Edit, View, Draw, Model, Tools, Help) and a toolbar. A project tree on the left lists various elements like CDD, Différé, Scrubs12, Anesthésiste, Chariot, CommisApprov, EspaceScrubs, Main, MD, NurseChir, NurseLits, NurseLits1, NursePost, NursePost1, Personne, Scénario1, Simulation: Main, ParametersVariation: Main, ParamVariationScéna, Run Configuration: M, Database, Resources, Urgences V1, and Scrubs Management7. A context menu is open over the 'Run' button, showing options like New, Open with, Open..., Close All, Collapse All, Cut, Copy, Paste, Delete, Rename..., Format Code..., Run, and Debug.

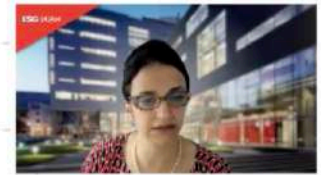
On the right, the 'ParametersVariation - Pa...ter Variation Experiment' panel is visible, showing a 'Name' field, a 'Top-level agent' image, and a 'Maximum availabl' field. Below this, the 'Parameters' section is set to 'Varied in range' with 'Number of runs' set to 10. A table lists parameters and their values:

Parameter	Type	Value	
		Min	Ma
p_nbMD	Fixed	17	
p_nbAnes	Fixed	17	
p_nbInfChir	Fixed	102	
p_nbInfLits	Fixed	19	
p_nbInfPost	Fixed	19	
p_nbCommis	Fixed	1	
p_nbAdmin	Fixed	2	
p_Type	Fixed		
p_Probalnfecte	Fixed	0.05	
p_Prob...eappro	Fixed	0.02	

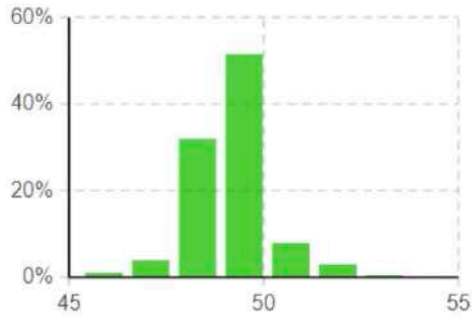
The 'Model time' section shows 'Stop:' set to 'Stop at specified time', 'Start time:' set to 0, 'Start date:' set to 2021-03-04, and 'Stop time:' and 'Stop date:' fields. Below this, there is a section for 'Additional experiment stop conditions' with 'Enabled' and 'Expression' columns.

La simulation

Analyse de la performance actuelle

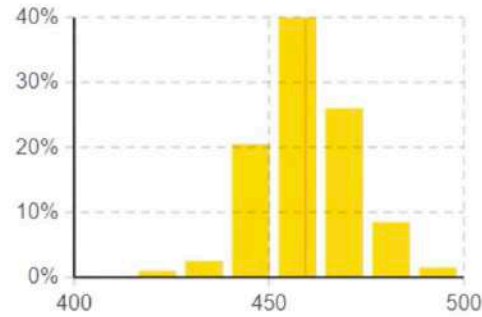


PerformedSurgeriesHistogram
200 samples [46...53]. Mean=49.065
v_SurgeConf 0.168



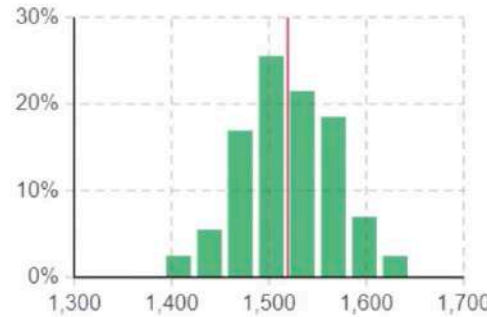
Completed Surgeries 49.06

LengthofStayHistogram
200 samples [416.45...494.431]. Mean=459.363
v_LengthConf 1.686



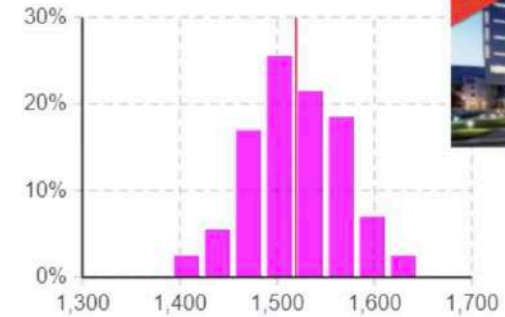
Total Length of Stay 459.36

UsedTopsHistogram
200 samples [1,405...1,631]. Mean=1,519.41
v_TopsConf 6.629



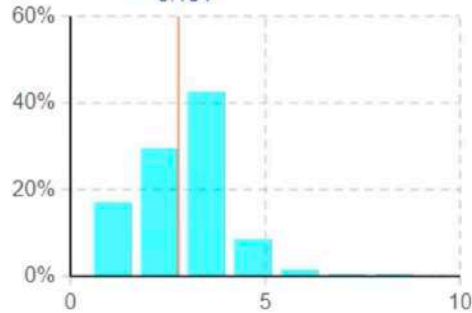
Used Tops Histogram 1,519.41

UsedPantsHistogram
200 samples [1,405...1,631]. Mean=1,519.41
v_PantsConf 6.629



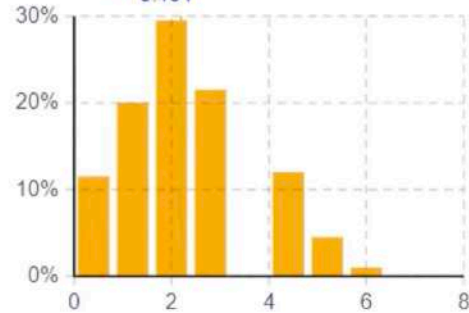
Used Pants Histogram 1,519.41

InfectedMDHistogram
200 samples [1...8]. Mean=2.775
v_MDConf 0.184



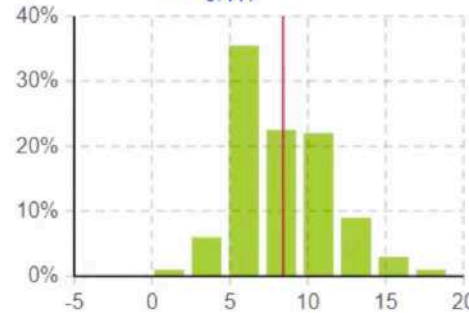
Infected MDs 2.77

InfectedAnestHistogram
200 samples [0...6]. Mean=2.2
v_AnesConf 0.191



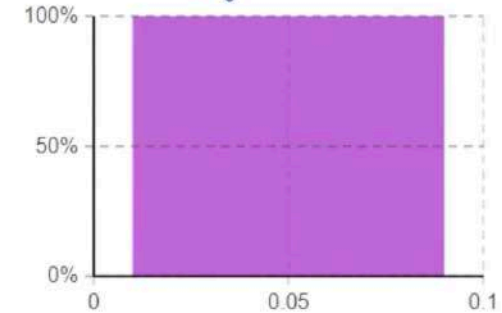
Infected Anesthetists 2.2

InfectedNursetHistogram
200 samples [2...17]. Mean=8.4
v_InfConf 0.417



Infected Nurses 8.4

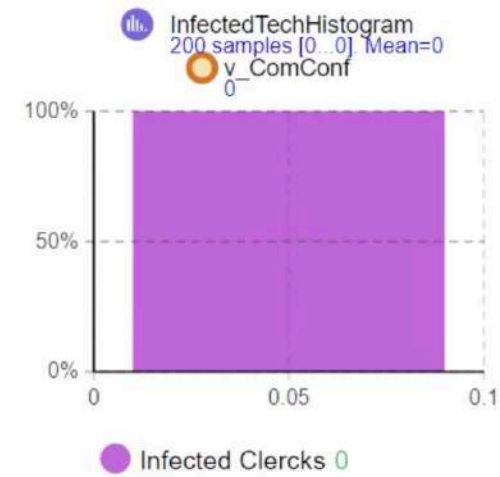
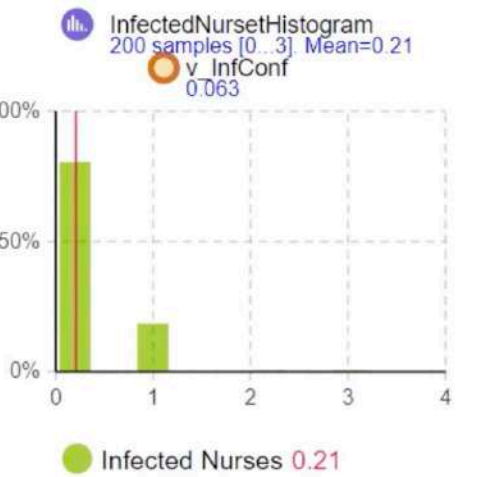
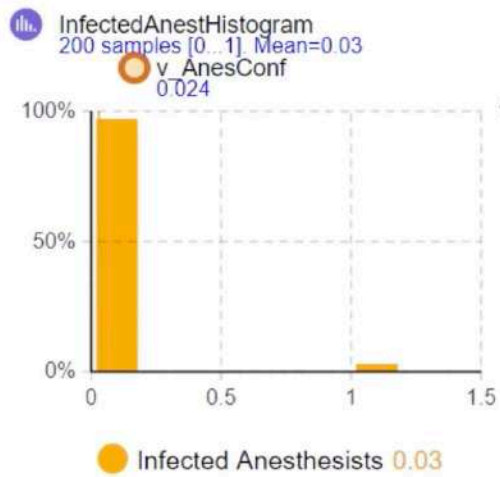
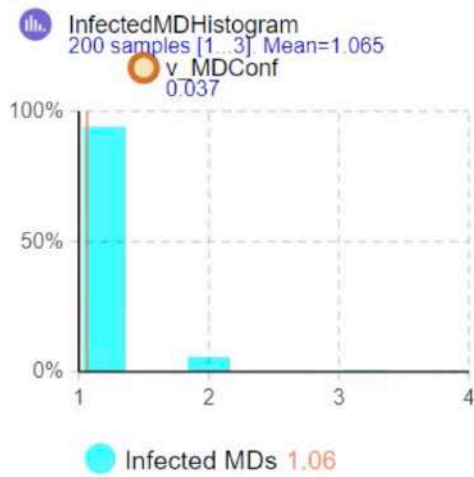
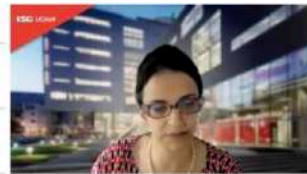
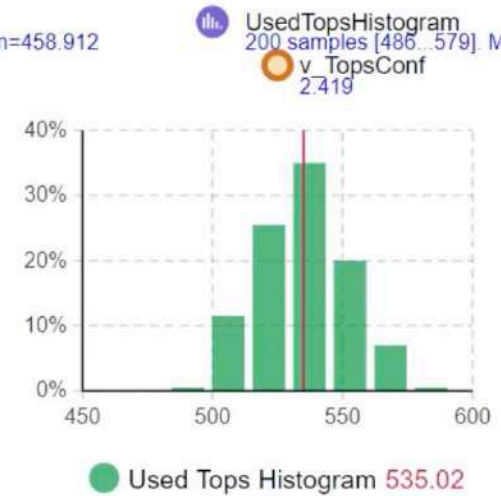
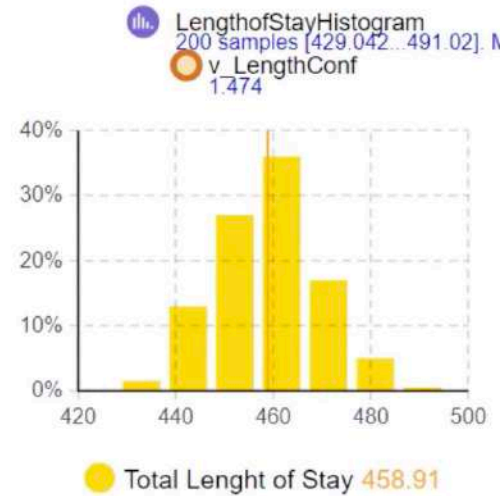
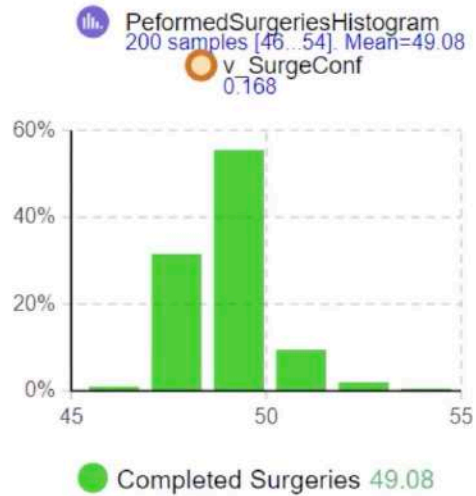
InfectedTechHistogram
200 samples [0...0]. Mean=0
v_ComConf 0



Infected Clerks 0

La simulation

Analyse de la performance avec la solution identifiée



Cas d'étude

Les EPI_PPE (gestion des scrubs)



Les solutions retenues

- Technologies RFID passives UHF
- Armoires connectées
- Distributrices automatisées
- Révision des processus
- Nouveaux aménagements

Gestion des scrubs

Ligne de produits



Cas d'étude

Les EPI_PPE (gestion des scrubs)



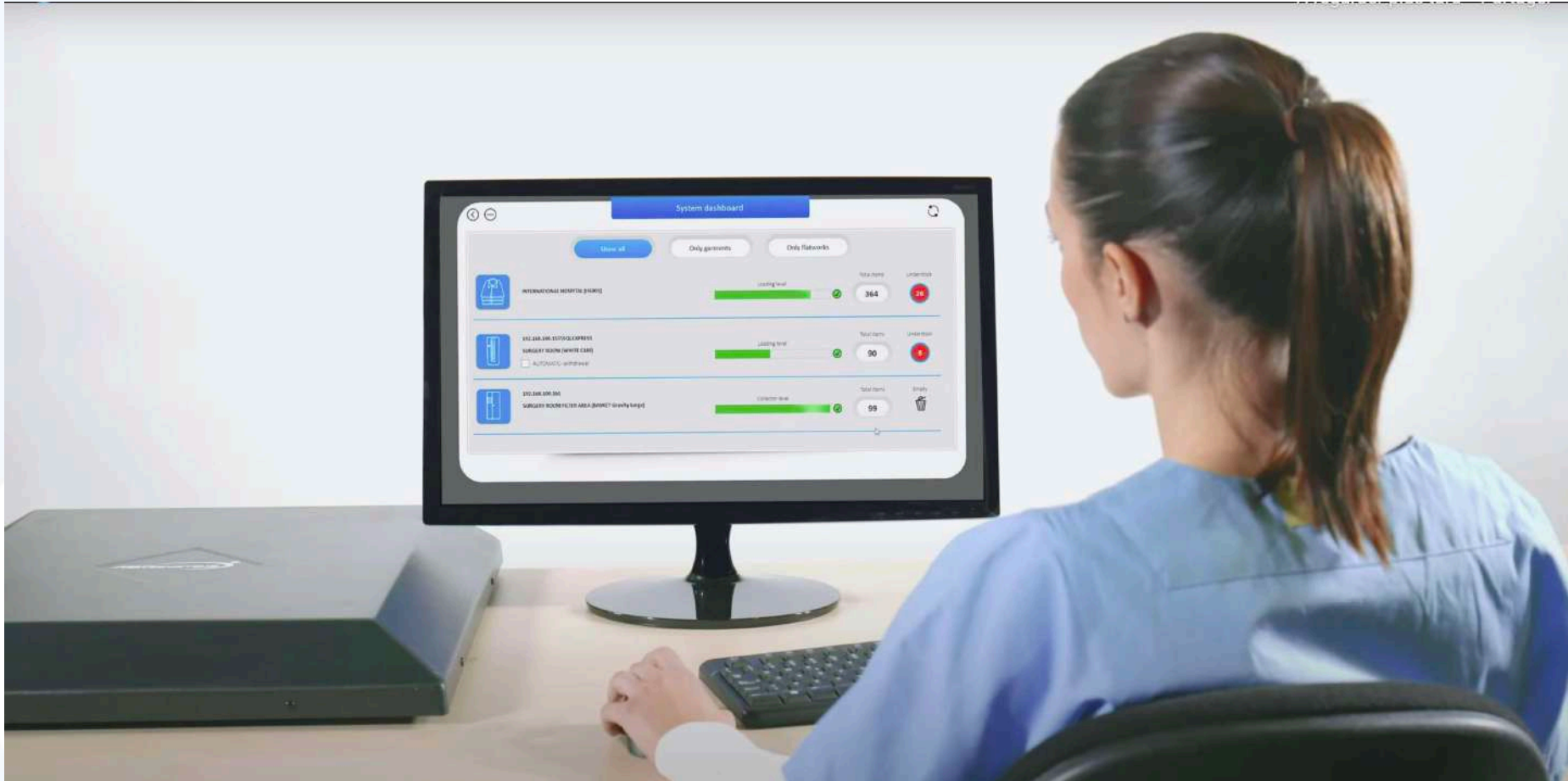
Option 1 : armoires RFID

Gestion des uniformes médicaux (suivi des uniformes dans les espaces)



La valeur

Des solutions qui misent sur la capture automatique de données



Étude de Cas

Gestion des uniformes médicaux



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THE IMPORTANCE OF SCRUB MANAGEMENT SYSTEMS DURING THE COVID 19 PANDEMIC

Hôpital général juif Jewish General Hospital

15 MAY 2020 | IN NEWS



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<https://www.abgsys.com/the-importance-of-scrub-management-systems-during-the-covid-19-pandemic/>

Étude de Cas

Gestion des uniformes médicaux



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RFID JOURNAL

CASE STUDIES

Hospital Meets High Demand for Scrubs With RFID

BY CLAIRE SWEDBERG

Montreal's Jewish General Hospital leveraged its existing RFID management system for tracking hospital garments to enable an overnight ramp-up of scrubs demands to meet COVID-19 related regulations.

May 24, 2020 Montreal's **Jewish General Hospital**, along with its technology providers, took a strategic and measured approach when it deployed an RFID-based solution for tracking healthcare workers' uniforms. The medical facility is the largest hospital in a group known as **CIUSSS** (Le Centre intégré universitaire de santé et de services sociaux), an integrated healthcare provider with multiple centers that employs 10,000 individuals.

In September 2018, the hospital deployed an RFID solution to track scrubs and other healthcare worker clothing from dispensing to laundry, then back into clean cabinets for reuse. The deployment planners spent months examining solutions, piloting the technology and training the targeted users—physicians and nurses in the OR—to employ the system. The result, according to the hospital, was a well-received and effective solution.

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<https://www.rfidjournal.com/hospital-meets-high-demand-for-scrubs-with-rfid>

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