Use Case Title: ICU Patient Care in an Isolation Room

Short Description: Jerry has been admitted to the hospital with a severe Covid-19 infection. He was extubated a few days ago and is now ventilated non-invasively in an isolation room. The hospital's focus is taking care of Jerry as good and as efficiently as possible. To achieve this, the alarm management, documentation, remote control, and data aggregation happens from outside of the isolation room based on new interoperability principles in a **Multi-Modality System Concept**.

Traditionally, caregivers would need to enter the patient room for handling patient alarms, documenting vital signs and alternating device settings.

Value: Remote control and monitoring can be used to improve patient care by eliminating some treatment delays, reducing the infection risk to the Healthcare Worker and helping to preserve the limited supplies of personal protective equipment (PPE).

Participating Vendors: Dräger, Ascom, OR.NET, Epic

Scenario	Vendor	Products	Standards
Introduction Dealing with severely infectious patients such as COVID-19, healthcare workers (HCWs) are at greater risk of infection due to their frequency and time in contact with the infected patients. The HCWs commonly enter the patient room to administer care to the patient and manage the therapeutic equipment. This management of the patient's therapy often requires monitoring with physiologic patient monitors and therapeutic support with ventilators and infusion pumps which may be delayed due to the need for HCWs to protect themselves by donning PPE to enter the patient room and removing the PPE upon leaving. This process can exceed 15 minutes depending on the PPEs used.			

Infectious diseases confer a synergistic burden on and risk to the patient due to the requirements for isolating the patient including poorer care and impaired coordination of care and family visits, increased rate of adverse events and increased depression (compared to other inpatients). Remote control and monitoring can be used to improve patient care by eliminating some treatment delays, reduce the infection risk to the HCW and help preserve the limited supplies of PPE. Medical devices that support open interoperability technology can provide remote access to view parameters and adjust settings thereby increasing efficiency, saving the costs of the PPE and most importantly increasing the safety of the HCW. The incorporated standards enable the bidirectional transfer of standardized data between systems in medical-grade quality, remote control of device functions, and a high level of cybersecurity, which are limited in today's solutions on the market. The communication between devices and systems in the showcase is leveraging the IHE Devices' "Services-oriented Device Point-of-care Interoperability" (IHE SDPi) profile. This includes the standards of the ISO/IEEE 11073 SDC standards family. The architecture defined in the SDC standard is built on the principles of a clinical workplace Service-Oriented Medical Device Architecture (SOMDA). The Medical Device Profile for Web Services (MDPWS), as well as the Basic Integrated Clinical Environment Protocol Specification (BICEPS) are ISO/IEEE 11073 standards for the communication inside a SOMDA system. The medical device- to -IT communication uses IHE-PCD-DEC profiles that send HL7® v2 messages between Device Observation Reporters and Consumers (DOR/DOC).			
Jerry is admitted to the ICU after a severe Covid-19 infection. He was extubated a few days ago and for breathing support as well as diaphragm training and pneumonia prophylaxis has to be ventilated non-invasively (NIV) up to four times a day (and also overnight). Jerry's treatment is supported by a **Multi-Modality System Concept**. He is placed on a Dräger Savina 300 ventilator, Arcomed infusion pump system and a Dräger Infinity M540 physiological patient monitor. The Dräger Point-of-Care Cockpit in the anteroom aggregates data from these point-of-care devices and allows remote control. Possible alarms will be	Dräger Ascom Epic OR.NET		IHE-SDPi (including ISO/IEEE 11073 Family)

distributed to the Ascom Myco and Digistat Smart Central dashboard. Electronic documentation of vital signs is done using the Epic EMR system. After the daily visitation and morning routine the therapeutic team (physicians, respiratory and occupational therapists together with the caretaker who is responsible for this patient) adapt the NIV to the current situation and start the first NIV trial of the day. – Start NIV-BiPAP on Ventilator [show waveforms occurring on Point-of-Care Cockpit] – Clonidin pump rate is checked and adapted [show new rate on Point-of-Care Cockpit] – Monitoring alarm limits of SpO2 and HR are adapted [show dialog and settings in Point-of-Care Cockpit]			
Now that the patient is in his NIV trial the team stays in the room a little longer watching that the patient tolerates the new settings before they leave the room. The caretaker will stay a while in the anteroom of the patient's room doing the documentation within the EPIC patient data management system including validation of automatically entered data from the devices in the room. He observes through the window of the door that his patient is doing well before he leaves.	Epic		IHE-PCD-DEC (including HL7v2)
Before the caretaker leaves the anteroom of his patient, he remotely starts the NIBP interval using the Point-of-Care Cockpit outside the room. Due to the default time interval of 15 minutes in this unit the interval will start now and after the initial measurement (ensuring that the patient is in stable conditions) the caretaker will leave the room. – Start NIBP interval on Point-of-Care Cockpit	Dräger		IHE-SDPi (including IEEE 11073 Family)
After 10 minutes an alarm occurs on the Myco mobile device of the caretaker, displaying an oxygen saturation (SpO2) low alarm from the patient monitor that remains silent in the	Ascom, Dräger		IHE-SDPi (including IEEE 11073 Family)

room. The same alarm will occur on the Ascom Digistat Smart Central, so that other caretakers are informed as well. If the caregiver is busy and can't acknowledge the alarm, the alarm notification would be escalated to the Myco 3 of the backup caregiver. To check the urgency of this alarm, the caretaker walks over to the patient anteroom checking his vitals on the Point-of-Care Cockpit and visually through the window (for example if he is stressed or does he look in pain) – Show alarm on Myco device – Show Ascom Digistat Smart Central – Show active alarm logbook on Point-of-Care Cockpit			
It looks like Jerry is stress- and pain-free and the alarm limits have been set a little too narrow. The caretaker does not have to enter the patient's room (disturbing the patient in his NIV trial) to check a situation or adapt alarm limits, which does not currently require action. This will also save time for caretakers because they don't have to put on any PPE. As the caretaker is already in the anteroom of the patient's room, he uses the Point-of-Care Cockpit to check the syringe pump's volume to prevent another alarm in a few minutes. He also checks the vitals of his patient at the Point-of-Care Cockpit. – Show sensors/parameters pumps dialog on Point-of-Care Cockpit and check the pump data – Open EventBar, change resolution, check vitals	Dräger OR.NET		IHE-SDPi (including IEEE 11073 Family)
The situation seems stable, and the patient tolerates the trial pretty well. The caretaker decides that he can prepare the medication and some other things before he will end the first NIV trial of the day (in ca. 10 minutes). He adapts the heart rate (HR) and the SpO2 alarm limits a bit tighter to ensure that they fit to the situation.	Dräger		IHE-SDPi (including IEEE 11073 Family)

– Show alarm limit adaptation outside the room on Point-of-Care Cockpit			
About 10min later the caretaker comes back and at the same time an alarm of the syringe pumps occurs. The patient has changed his position and is lying on the Intravenous (IV) line of his clonidine infusion. The alarm is distributed to both the Point-of-Care Cockpit and on the Digistat Smart Central dashboard outside the room. In addition, the respective caretaker is informed on his Myco 3. – Show alarm banner with "occlusion" alarm – "Audio Pause" the alarm before entering the room The caretaker now enters the room, equipped with PPE, some new medication syringes and IV lines (which he prepared in the meantime) as well as a helper outside the room who will receive the blood gas analysis after the NIV trial.	Ascom Dräger OR.NET		IHE-SDPi (including IEEE 11073 Family)
Outro Everything went well, the patient is on the right path and the next NIV trial can be scheduled in 4 hours, just before lunch. Jerry looks very well and seems to benefit from the breathing support. As you saw the interoperability of the Multi-Modality System Concept, including Point-of-Care Cockpit, syringe pumps, patient monitor and the ventilator as well as a smart alarm management make it possible for caretakers to monitor the patient reliably and safely while reducing unnecessary patient disturbance and simultaneously improving staff efficiency and safety.			

Data exchange standards:

Vendor	Product	Category	Protocol	Interop Body	Interop Profile	Interop Actor	Interop Message	Send or Receive	Transaction Description
Dräger	Infinity M540 patient monitor Point-of-Care Cockpit Savina 300 Ventilator	Point-of-Care Medical Devices	SDC	IHE SDPi				Send & Receive	Send & Receive Vitals Send & Receive Alarms Execute Remote Control
			HL7	IHE PCD	DEC	Device Observation Reporter	PDC-01	Send	Communicate PDC Data
EPIC	EpicCare	Electronic Health Record	HL7	IHE PCD	DEC	Device Observation Consumer	PCD-01	Receive	Communicate PCD Data
OR.NET	Arcomed Infusion Pumps	Point-of-Care Medical Devices	SDC	IHE-SDPi				Send	Send Infusion data
Ascom	Digistat Smart Central Unite Myco3	Alarm Distribution	SDC	IHE-SDPi				Receive & Send	Receive Alarms Send Confirmations