

# Infection Control & Hand Hygiene

## “Use What Works”

By Peter Mojica, Chief Technology Officer / CIO bioVIGIL Systems

A number of years ago I was sitting in an executive briefing and one of my colleagues asked a seemingly unobtrusive question to the main presenter at the end of their dog and pony show; “... *so what would you use if you were making the decision?*” (For context, as the head of Information Technology for one of the largest banks in the U.S., I was there taking part in a vendor technology evaluation in preparation for a gargantuan information systems software purchase). The question was powerfully simple and simply powerful. In fact, after grasping the full magnitude of the elicited response, I have added this question to my due diligence lexis. All the same, given the financial significance and organizational gravity of the situation, the speaker’s answer was even simpler and even more powerful than the question itself; “...*use what works*”.

That simple answer [use what works] has stuck with me ever since. And aside from the sheer elegance and brilliance of the answer, it’s not hard to understand why, given that we were in Redmond, Washington at Microsoft headquarters and the person who gave that answer was Bill Gates.

Looking back, when I consider all of the many generic and canned forms that answer could have taken; everything from ‘use what yields you the lowest total cost of ownership’, or ‘use what leverages your current infrastructure’, or ‘use what gives you the best return on investment’ - I appreciate why Microsoft was awarded the deal.

So how is this anecdote related to the topic of Healthcare Associated Infection (HAI) control, Hygiene Compliance and Hand Washing improvement?

As more and more vendors claim to address these perilous issues facing healthcare today and the stakes are incredibly high in terms of patient safety, quality of care and hospital bottom lines ‘*using what works*’ is the only thing that should really matter. However, as a result of the enormity of today’s problem with the lack of hand-hygiene compliance in healthcare and the enormity of the financial opportunity for those who solve it numerous healthcare product vendors are trying to “cash in” by utilizing kludged technologies, which are generating grievously questionable outcomes and potentially harmful consequences. Leading the pack are the RTLS, NFC and Sanitizer vendors.

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**Real-Time Location Systems (RTLS)**  
RTLS based systems have been successfully deployed in healthcare settings for a number of years now, and it’s only as of recent that they have been adding hand-hygiene monitoring and compliance improvement into their overall product portfolio.

Since RTLS products are primarily designed to track and find ‘assets’ they can definitely play a role in the infection control space, especially as it relates to cross-contamination and rewinding and replaying the location of potentially contaminated physical assets. There is no doubt that the fundamental and primary value proposition for all RTLS products is to “track and find things better”. However, if you take a closer look at these RTLS providers attempt to address hand-hygiene, what you will find is analogous to the old adage; “if the only tool you have is a hammer (or an RTLS network), you tend to see every problem as a nail (or a network problem)”.

I would challenge any RTLS vendor to explain how they track an 'actual' compliant hand-washing event or lack thereof; much less provide an effective mechanism for intervention that is not fraught with false positives and false negatives. The simple fact is that their current product offerings can't and won't.

Without a shred of doubt, this shouldn't be a surprise to either the RTLS vendors or healthcare stakeholders, because it's a widely recognized and acknowledged fact that the entire RTLS industry lacks the requisite technology to accurately ascertain a very basic data element known as "context".

#### The Need for "Context"

When I talk about 'context', from this perspective, I mean a factual and literal understanding of a final condition or outcome. For example; Dr. Smith 'did' or 'did not' wash his hands in accordance with compliance mandates after entering patient room #507 on Thursday June 4<sup>th</sup> at 12:46 pm.

By contrast, an RTLS product has to deduce that Dr. Smith was probably in patient room #507 at approximately 12:46 pm and was in close proximity to an alcohol dispenser and that it may have dispensed alcohol and that he might have used enough of it on his hands to suggest a compliant hand washing event.

Another way to expose the lack of data context as it relates to RTLS is by understanding its design intent - which is to track assets. For example, when tracking an infusion pump to determine if it is currently being used on a patient the RTLS product will consider

what it knows about the location of a pump and will make an educated guess as to its use status. Inferring rules such as; if the pump is 'in a patient room' then it must be 'in use' and if it's 'not in a patient room' then it's 'not in use'. These assumptions of 'in use' or 'not in use' are stored as data values in a database and are ultimately evaluated to make determinations on things like 'average time in use', 'average idle time' and 'overall utilization' - which admittedly is valuable information when deciding to buy additional infusion pumps.

On the other hand, its plain common sense that just because a pump happens to be in a patient room it doesn't definitively mean that it's 'in use'. In fact, it could merely be sitting idle waiting to be picked up by Central Services. It is also plain common sense that just because a pump is in a hallway does not mean that it's definitively 'not in use'. It might simply be attached to a patient heading to the cafeteria. This scenario demonstrates the basic drawback of providing real 'context' for RTLS products. In essence, these inferred rules and assumed conditions are huge 'leaps of faith' on a final condition or outcome.

Now, this doesn't mean that RTLS products don't work for their intended purpose. These decisions rely more on statistical weightings and averages that come into play when dealing with thousands of assets over time and are usually 'good enough'. For example; these leaps of faith are perfectly acceptable for making a decision whether or not to send Jerry from Sterile Processing to a dirty utility room to retrieve soiled assets.

*"When it comes to the monitoring of Hand Hygiene and reporting for Compliance - it's simply not good enough to guess and leaps of faith don't cut it".*

Obviously the exactness of the information in this scenario is not mission critical or life threatening.

#### Near Field Communications

Conscious of the inherent technology limitations with regard to context, RTLS vendors are adding another layer of technology to their products called Near Field Communication (NFC). NFC is a newer innovation that helps these products generally establish when things are 'near' or in close 'proximity' to one another. NFC typically involves wireless short-range high radio frequency identification technology which enables the exchange of data between devices typically over a couple of inches. When these devices are in close proximity to one another, the system once again infers that some event or outcome has taken place.

Although this does add a deeper level of insight to actual events, inferences and assumptions are still required as it relates to resolving context. For example, when Dr. Smith enters room #507 and goes near a hand sanitizer for a pre-designated period of time, the system takes a leap of faith and assumes that he has 'washed' his hands adequately before treating the patient. But did Dr. Smith 'actually' wash his hands correctly? Who can be sure?

#### Dispenser Based Systems

Another approach that RTLS, NFC, RFID and other 'hand-

washing' vendors are taking in an effort to try and overcome their inherent context limitations, is by making the hand-sanitizer dispenser part of the network itself (...seeing every problem as a nail - or a network problem)". Here, they are either fabricating or retrofitting RFID chips or NFC targets into the dispenser to make them part of the network. Now what happens is even more complex; the sequence of events tries to detect when the unit has dispensed chemical sanitizer and then correlates that event with a proximity event to draw a

conclusion. For example, Dr. Smith was in room #507 within inches of the dispenser when it supposedly dispensed sanitizer so he must have 'washed' his hands adequately prior to treating the patient.

Obviously, this conclusion is subject, not to mention that there is usually no way for the system to know if Dr. Smith used the appropriate amount of the sanitizer to actually kill pathogens or if he even used it on his hands or if the dispenser even contained any sanitizer. What if Dr. Smith

happened to be standing next to the dispenser reading the patient chart while the resident was washing her hands? Or what if the transport person who has just dropped off a patient in the ICU that has a dangerous skin-borne contagion then comes to into room #507 to take the patient down to radiology for an exam and he gets 'near enough' to the dispenser to confirm a compliant hand-washing event? These are the types of false positives that can render a system that is intended to increase compliance positively useless.

*"I can think of many instances where a solution that is "good enough" can work, and this isn't one of them"*

How would you feel if...

How would you feel if your mom is a patient at a hospital that applies this same type of [leap of faith] process of best guesses to its Infection Control and Hand Hygiene programs? Is it really good enough for your mom knowing that HAI's are a leading cause of death in America and that more than 60% of these deadly micro-organisms are transmitted because healthcare workers fail to compliantly wash their hands – even between patients? Is it really good enough for your mom knowing that a nurse who is putting a central-line catheter in her vein might have just been in the room down the hall treating a MRSA infected patient, or worse? So when the question is asked '...what would you use'? You should also ask yourself these questions: 'Is this really good enough'? And, 'Am I willing to place my mom in the hands of a solution that is based on 'guessing' and taking 'leaps of faith'?

Let's get serious; forgetfulness, laziness and non-compliance are the realities of human nature, healthcare and many other regulated industries. If healthcare workers did their job without flaw and were 100% hygiene compliant no one would be having these discussions and over two million people a year would not get complications from HAI's - and tens of thousands of patients would be leaving the hospital through the front door instead of the morgue. So regardless of how many data points are gathered to make an assumption it is still just an assumption, a best guess, a leap of faith. So if you ask me the question; '...what would you use for your mom?' My answer won't be; 'something good enough...' because I am not willing to take that leap of faith.

My simple answer is to "use what works".

So what works?

In order to apply the "use what works" philosophy to hand-hygiene the solution must incorporate the following critical elements:

***Purpose Built:*** A solution should be 'purpose built' for hand-hygiene and not an add-on to a solution that was fundamentally designed and built to do something different.

***Simply Simple:*** A solution should by design be easy to use, install and maintain with little to no user interaction. By definition 'compliance' is hard, and regardless of the industry it is perceived as extra work. This is why 'simple' has to be used as the counter balance to increase both user and organizational adoption. A solution that requires considerable workflow or network

changes is fundamentally a non-starter. The people that are already compliant should not have to drastically change the way they perform their duties in order to use a new solution. In addition, a network should not require any augmentation, calibration or additional maintenance in order to host a new solution, more importantly the network should not be the solution.

**Accurate Context:** A solution has to detect, with exactness, the proper execution of a compliant hand-washing event. Guesses and false positives are not acceptable. With anything less than 99.9% accuracy, it is impossible to award with a carrot or penalize with a stick – people will become disenchanted with the solution and management won't stay committed.

**Information Communication:** Useful and pertinent information should be generated and made available to everyone involved as a result of utilizing the solution. In other words, add value for the patient, end users and the organization. All the stakeholders must be able to

answer the question; 'what's in it for me [WIIFM]?' The solution should be designed to encourage SOCIAL and self-compliance vs. organizational-enforcement.

**Mobility:** Supporting mobility in information delivery and overall is key. The notion of fixed dispensers being mandatory or fixed anything for that matter as a requirement for hand-hygiene monitoring and compliance is old thinking and will have an adverse affect on end users workflows and actually work to decrease end user adoption.

**Staying Ahead of the Curve...**

In order to increase hand-washing compliance and decrease HAIs, the simple question and answer is all that really matters.

Question: "...what would you use?"

Answer: "...use what works."

RTLS solutions share common components that are *all needed* to implement a hand-hygiene solution. The base component includes a network to transport information; this utilizes a dedicated meshed multi-hop wireless sensor network operating on 802.15.4, or a shared 802.11, or a radio data 433 MHz network, and in some instances ultra-sound. No matter the protocol of a wireless sensor network a transport is necessary, and not to just move bits of data from one point to another, but to account for the fact that the intelligence for these systems is often found in the 'network' and not within the devices. This is why the network is imperative for RTLS products to function.

RTLS devices are generally meant to be placed on assets for tracking their location and are designed to have long-battery lives. One way of achieving this is to design the devices with as little data overhead as possible or 'dumb'. So the network is necessary to 'figure out' where a device is located. So although a device is actively transmitting its location status, it never actually knows its own location, all it's doing is saying 'here I am' – much like a game of Marco Polo. So it's the role of the network, in combination with sophisticated triangulation or location resolver algorithms running on the network to estimate its probable location.

As it relates to hand hygiene RTLS, NFC, RFID or all three kludged together, they attempt to do the following. A clinician wearing a device (usually in the form of a badge) walks up to a hand-hygiene station (also outfitted with a similar device) and the proximity or the relationship between these two devices for a specified duration creates an event, which is then transmitted and picked up by the listening network, which in-turn is sent to a dedicated server and algorithmically approximated and then the entire data set is transmitted along to another server to be further processed by an application, which is then presented in the form of reports and charts. Although this seems like a technological phenomenon, the one thing that still remains an unknown is determining if the clinician actually washed his or her hands?

From a compliance perspective these 'solutions' are highly prone to false positives and false negatives and they certainly do not satisfy the intended use cases for hand-hygiene monitoring and compliance systems, which is to detect, intervene and continually improve non-compliant hand-washing events. So until these solutions get a real handle on true 'context' - the best that you can expect is the accurate reporting of proximity and the leap of faith that something happened.