



## **Selecting Patient Monitoring Systems: Wearable, Contact-Free, and Continuous Vital Sign**

### **Michael Wong:**

Thank you for listening to the Health and Safety Podcasts.

I am Michael Wong, founder and executive director of the Physician-Patient Alliance for Health & Safety.

The Physician-Patient Alliance for Health & Safety believes that all patients receiving opioids should be continuously electronically monitored in health care facilities. We are often asked by our clinical followers what patient monitoring systems that we would recommend. To help with the decision making process, today, we will be discussing some factors and studies that may help with that selection process.

In, addition as advocates of continuous patient monitoring, if I can be frank, I believe that we have failed to speak at length about the benefits of patient monitoring. Preventing adverse events and patient deaths has been our focus. We have not made as good a financial argument for continuous patient monitoring as we might have. A human life can never be measured in dollars and cents. That said, I understand that executives are responsible for keeping their healthcare facilities profitable. Clinicians trying to convince executives of the need for capital expenditures often have to demonstrate the financial implications of such an investment. Do the dollars and cents spent provide a return on investment? Do the dollars and cents spent help improve work efficiency or optimize bed usage?

To help answer these questions and provide some guidance on selecting patient monitoring devices, I have with me a great panel of experts:

- Melissa Powell is chief operating officer of the Allure Group;
- Priyanka Shah is project engineer at ECRI Institute; and
- Charlie Whelan is director of consulting, transformational health at Frost & Sullivan.

Welcome to the podcast.

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Let's start with some brief introductions for listeners. Melissa, let's start with you. Could you please give us a brief introduction?

**Melissa Powell:**

Sure. Hi, Michael. My name is Melissa Powell. I am the Chief Operating Officer for The Allure Group, which is a chain of sub-acute and long term facilities in New York City. We have 1,500 beds throughout Brooklyn and Manhattan, and we work closely with hospital partners to bring patients to our locations for sub-acute rehab to then go home, as well as long term care services.

**Wong:**

Great. Thank you, Melissa. That was a good introduction. And, Priyanka?

**Shah:**

Sure, Michael. I am a Project Engineer in the Health Devices Group at ECRI Institute. ECRI Institute is a 50 year old, not for profit healthcare and research organization that's based out of Plymouth Meeting, Pennsylvania. My background is biomedical engineering and, here at ECRI, I have been researching and writing comparative evaluations of medical equipment, mostly patient monitoring for the last three years. So far, I have covered wearable, contact-free, and continuous vital sign monitoring systems for lower acuity care areas, as well as ICU physiological monitoring systems with a focus on alarm management.

**Wong:**

Thank you so much, Priyanka. And, last, but certainly not least, Charlie?

**Charlie Whelan:**

Thank you, Michael, for the invitation me to join the podcast today. My name is Charlie Whelan. I am director of Frost & Sullivan's Transformational Healthcare Practice. Frost & Sullivan is a 55 plus year old, global market research and consulting company. And, I have done a number of projects in the patient monitoring space looking at their impact on the continuum of care and related healthcare economics.

**Wong:**

Excellent thank you so much, Charlie. There are a number of continuous monitoring solutions available- bedside system's, wearable, as well as non-contact systems. Priyanka, perhaps could you give us an overview?

**Shah:**

Absolutely. So, these systems are used in lower acute care areas, such as a medical-surgical floor, with an intent to continuously monitor vital signs that help in detection and notification of changes in patient's status to the clinician. These changes could be impending sepsis, general deterioration, or respiratory depression. Because we know that these conditions develop over the course of hours, the theory is that continuous monitoring can help identify problems that arise between spot check intervals. In practice, spot check monitoring is usually the standard of

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care in these settings. Now, into the various modalities. Wearable systems include small and lightweight display units, which is attached to the patient and allows the patient to move more freely. Then, there are non-contact or contact-free systems that monitor certain vital signs, without any physical connection to the patient. These systems typically use a sensor placed on a bed or a chair, which means that they can only monitor stationary patients. There is one more solution that involves using a spot check monitor, which can be part of the bedside and used in a continuous mode. So, any of these modalities could be used to do continuous monitoring.

**Wong:**

Excellent thank you so much for that overview. Frost & Sullivan wrote two research papers- one "Finding Top Line Opportunities In A Bottom Line Health Care Market" focused on hospitals and another "Technology as a Competitive Edge for Post Acute Providers" focused on post acute facilities. What's Frost & Sullivan's interest in technology and how that technology might enable safer care and better financial results, Charlie?

**Whelan:**

At Frost & Sullivan, we're always interested in technology that can have a significant improvement on patient care, while at the same time make economic sense. In the case of contact-free continuous monitoring, we saw a technology that was in its early stage of adoption of the market, but which had both a clear clinical and economic value proposition. It's rare that I find a medical technology that clinicians and administrators are equally excited about. Also the perceived simplicity of the system in that it only monitors three metrics - heart rate, respiratory rate and motion, but which in turn can generate extremely useful insight they could help detect patient deterioration, fall risk, pressure ulcer risk, and other serious conditions - was interesting to me. We hear so much about analytic solutions today that cut across many different types of data, but here was a system that's extremely focused on what it monitors and is able to generate tangible benefits.

**Wong:**

So, Charlie, you refer to contact-free continuous monitoring, one of the types of monitoring systems mentioned by Priyanka. Do the conclusions in your reports apply to all patient monitoring systems or just some?

**Whelan:**

Well, we got to be clear that there's continuous monitoring, there's contact-free continuous monitoring, and then there's patient monitoring in general, which is a larger category. In the case of these two papers, we're looking explicitly at contact-free continuous monitoring, as opposed to monitoring in general, and looking at the specific benefits that that type of monitoring technology can deliver.

**Wong:**

Thank you, Charlie. And, Priyanka, do you think the conclusions that Charlie reached apply to other patient monitoring systems as well?

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**Shah:**

When it comes to contact-free monitoring, I am in agreement with Charlie. To generalize it to other modalities may require some more evidence and research. And, that is based on the experience we have had interacting with our internal health care facilities. So, the research that we did, we realized that contact-free monitoring could be a good choice to detect patient ulcers or falls, where the patients are expected to be in their beds. But, for example, to measure adequacy of ventilation, you would need a solution that offers you a measure of adequacy of ventilation.

**Wong:**

I certainly agree with you, Priyanka. Monitoring for adequacy of ventilation really recognizes that basic respiration - breathing in of oxygen and breathing out. And, Melissa, what has been the experience of The Allure Group with continuous patient monitoring?

**Powell:**

Well, in our facilities, we found that the monitoring system has been a driving factor in a lot of changes that we've seen for fall prevention, as well as pain management, as well as sepsis identification. Within our first month, we were able to have great success in preventing falls. In our first home, in the first 30 days, we prevented eight cases of falls by having the monitoring on, which obviously was beneficial to the patient and the patient's family member, but it also has a great impact on the facilities and the quality metrics but they're trying to achieve in regards to quality care. The monitoring systems are able to help us really have an early identification for motions to prevent a fall and are able to help through the monitoring to see the beginning of a sepsis episode. And, we are able to treat patients in-house in a more holistic, allowing the staff to feel very empowered to do this, because we are able to identify these things earlier.

**Wong:**

Thank you, Melissa, for sharing the experience of Allure. Hospitals and post acute care facilities are clearly two very different businesses, how are these two becoming more and more interrelated. Melissa, perhaps you could speak about your experience at Allure?

**Powell:**

Sure, so the sub acute solution has really become much more of an acute care setting than it ever had been in the past. Hospitals are discharging patients much earlier, so obviously what we're finding out when the patients come in, they're often so much sicker than we're used to, yet they feel like they're graduating to another level of care. So, having this ability to increase the patient's education and let them understand that they still have a bit of a process to go through before they get home is a necessity. And we're also finding the necessity to educate staff and to have physicians on site in subacute settings around much more often than they did in the past. The ability to increase your staffing levels and work one-on-one as much as you can. These monitoring systems really allows us to be able focus on where the patients are right now and what help they need right at this moment.

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**Wong:**

And, thank you, Melissa. And, Charlie, as a consultant with Frost & Sullivan, how do you see this interrelationship driving changes in the healthcare market?

**Whelan:**

Historically, the two types of providers operated independently with different revenue models. However changes in reimbursement policies that reward continuity of care, the prevention of hospital readmissions, and better outcomes are making hospitals and post acute providers much more aligned in their incentives, which is good news for patients and their families. One thing that continues to challenge post acute providers is that advances in medical technology and certain kinds of reimbursement models may encourage payers to skip post acute care in favor of home care for many patients. In order to survive, post acute providers need to become best in class in their market and be willing to take on those more complex patients that are not well suited for home care.

**Wong:**

So really, the alignment that you speak about is more financial than it ever has been in the past, right, Charlie?

**Whelan:**

Absolutely.

**Wong:**

And, Melissa, the acuity of patients has changed over the years. How might that affect what we've just been speaking about and what's Charlie was referred to?

**Powell:**

Yes, I agree with what Charlie was just speaking about. The level of care that the sub acute patients now require is just night and day from what it was even 10 years ago. The sub acute patients are really needing to receive care that is just much more at an acute level. Patients that they're seeing, as Charlie mentioned, have a lot more issues - pressure ulcers, their ventilator patients, trach patients, patients with severe cardiac issues - that really need to be monitored closely around the clock by nurses, as well as physicians. In the past, the physician was just not involved on an ongoing 24/7 basis, because the patients in the nursing homes were just not ill enough to require that. So, what's really changed is that not only do we have patients being seen by primary care, especially the sub acute patients, on almost a daily basis - but there's a cohort of consulting physicians that are able to come in - whether it be an infectious disease doctor or what have you - that would be able to come in and address patient-specific issues, without having to transfer a patient back to the hospital. And, it's really so beneficial for the patients, as well as their families and the staff that we're able to provide services here. In our settings, we are even now providing cardiac drips - there really is very little things that can't be done outside of a hospital setting.

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**Wong:**

So, how has continuous patient monitoring helped Allure with this situation and it's acute patients?

**Powell:**

The ability to have the continuous monitoring has changed a lot of our dynamics. Not only do they have the ability to monitor patient and to identify cases of sepsis, to be able to start treatment earlier that would then require no transition to a hospital, but it's allowed us to have some really great reporting outcomes that we're able to use as education pieces to the staff. It gives us really great view of what's happening 24/7 when facility's management just isn't there. And, they allow us to really be able to communicate with families and to the patients that there are great successes and this is what's going on in a great reporting format that's coming right from the monitor system.

**Wong:**

Well that's great. It sounds like documentation has helped you to figure if there are any gaps in care and demonstrate to patients and their families - and ultimately in the courtroom, and I'm thinking here as an attorney - to demonstrate what steps in that care have been taken. So, very valuable to do that.

**Powell:**

Sure. When you look at wound care, for example, because it's such a hot topic. The continuous monitoring, not only allows the employee to document that they did the turning, but it actually documents the turn itself. It recognizes that the patient was positioned differently, and it alerts the staff member if they didn't turn the person all the way. So, if they didn't offload the way that they're supposed to and they still need to work on that, the staff member wouldn't have necessarily known that in the past, they maybe would have walked out of the room. Now this gives them that prompting that they need to go back in and reposition and get that person moved appropriately.

**Wong:**

So, have you found that it's helped with workflow or process since you've started continuous monitoring patients?

**Powell:**

So, absolutely, but at first as with anything new, it takes a little time for employees to get used to it - they might become slightly overwhelmed, they have a lot of questions, and that's great - it shows we're working through those new workflow issues. But, now that the employees have learned how to use it, they've learned that it's time saver, which is exactly what we've seen. The continuous monitoring has been able to really cue them of that the patient needs them, and it's become a much more effective and efficient way to provide care at the bedside.

**Wong:**

And, Charlie, what's been your experience at Frost & Sullivan, in this regard?

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**Whelan:**

Well, I think that, like any new technology, it's going to have its learning curve. We talked a lot about the clinical benefits of time contact-free continuous monitoring, which of course is the most important, but, in our research, one nurse manager I spoke with, who used the system, explained it helps her staff improve their documentation too and reduce the number of claims that were rejected by payers - the end result was really interesting, because contact-free continuous monitoring demonstrate improved cash flow for the facility. And, I've heard a lot also about how the technology can help with nurse training and ensure better patient handoffs between shifts too.

**Wong:**

So, it sounds like what both of you are speaking about is that the easier the technology is to use the better will be its use and it's option. Priyanka, in working with our health care facilities what has been ECRI's experience in this regard?

**Shah:**

Sure. I agree with your statement, Michael, the easier the technology is to use, the better are the chances for its adoption. From ECRI Institute's experience, we have learned that a hospital first and foremost must try identify if continuous monitoring is indeed needed for that care environment. Once they have made a decision that they have a clinical need that could be solved using continuous monitoring, then of the key factors that drive the implementation and use of technology are how easy is the technology to use, staff education, and cost of implementation. Charlie and Melissa, they both spoke about staff education and clinicians have been traditionally using a spot check monitor or not using the monitor at all. Therefore, they need to learn both the new or modified workflow, and also a new way think about their patients.

Another factor is the costs of using the system. The initial cost is only one consideration. But, our healthcare facilities that we spoke with also mentioned the cost of consumables and the on-going and initial training cost. I would like to point out, as well, that when I talk about continuous monitoring, I am including all forms of monitoring - that includes wearable, bedside, and contact-free monitoring.

**Wong:**

So I'm just wondering whether the you think that an easier to use technology might be better suited for general care for patients and that maybe a more complex system is better suited in the ICU setting. What do you guys think of that?

**Whelan:**

Absolutely. The monitoring technology has to be appropriate to the level of care and the needs of the patient. So, you wouldn't use something like CFCM [contact-free continuous monitoring] in the operating room, for example, It just isn't relevant and there are a lot more metrics which you need to offer. So, to me the exciting potential is really extending the benefits of monitoring into those areas that have historically not then very reliant on monitoring- that would mean the

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home, it would mean post acute care facilities, where there is value, but the degree of monitoring and the technology needs to be appropriate, not only to the patient, but to the skill level of the providers and medical practitioners there.

**Wong:**

So, Melissa, I'm gathering you would concur that the ease of use of the patient marketing device has certainly impacted staff adoption and use?

**Powell:**

Absolutely. The ease of training is paramount. Also, I think that staff, once they start to see all the positive outcomes, they become bought into the system, as well. So, the ease of use gets over that initial fear of using it and then, as soon as they start to see the positive outcomes, then they really become bought into it.

**Wong:**

Absolutely. Thank you, Melissa. So, Priyanka, what types of questions should a healthcare facility look at when considering between the different types of continuous patient monitoring systems that are available?

**Shah:**

The first and foremost thing to consider is the clinical need. Clinicians should identify the parameters and the patient conditions that the care area plans to look for. And, then, find the system that claims to measure those parameters or conditions. You need to identify the system that has appropriate sensitivity and specificity for the clinical needs. Make sure that nurse aren't alerted to actionable alarms and not overburdened with non-actionable situations. Then, consider how well each prospective system would help attain the desired workflow for your care area. Once the patient conditions are called out, then one would look into the modality of monitoring - that is, wearable versus bedside versus contact-free. And, finally, consider the cost. Unfortunately, there is no size fits all solution.

**Wong:**

Great advice, Priyanka. Knowing what the clinical need is will certainly help in deciding what technological solution are the best fit. In "Finding Top-Line Opportunities in a Bottom Line Health Care Market," Charlie, you based your analysis on a 200 bed hospital near Chicago, Illinois, with 80 med-surg beds and an average occupancy rate of 85%. What did you conclude?

**Whelan:**

So, in that paper, we developed a hypothetical model using an average median hospital that was imaginary to determine what kind of impact economically speaking an imaginary average hospital expect to see with a very conservative adoption model of contact-free continuous monitoring. So, we laid out the assumptions that you shared, along with a number of other ones, describing a hospital that would add this type of monitoring to all of its 80 med-surg beds. And, what we found is that it could really result about two million dollars in additional revenue and an

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extra one percent to its operating margin, all while delivering better care. And this is being driven by three factors. First and foremost, use of contact-free continuous monitoring could decrease the length of stay, thereby freeing up bed space for new patients. Second, monitoring along those lines can improve clinical outcomes, thereby improving the facilities ranking under Medicare's value-based pricing model. Finally, contact-free continuous monitoring can help spot patients with conditions that might otherwise go undetected before it's too late, thereby generating the need for additional healthcare services that the hospital could provide.

**Wong:**

Those are great conclusions. Thanks so much for sharing that. What would you think is the obstacles to adopting continuous monitoring, Charlie?

**Whelan:**

I think first of all it's just awareness. Letting providers know about the technology and its ability to be adopted. I think there are some providers that are intimidated about integrating new technology into their system, but it's relatively simple compared to a lot of other IT platforms. And, the last one is really staff adoption and staff learning, integrate it to something that they're already doing. So, I think that awareness, IT Integration and the willingness to encourage people to try new things are the biggest challenges.

**Wong:**

There are many types of patient monitoring devices in the market and there are likely be more developed in the future. Do you see many different patient monitoring devices being developed within the same health care facility, for example, one device being used in ICU, another type on the general care floor, and yet another with pediatric patients or other types of patients. Charlie, what's your thoughts on that?

**Whelan:**

Absolutely. Like I had mentioned before, the monitoring technology needs to be appropriate to the patient. I think the more interesting things will be - what do you do with that data relative to the unique needs of that patient? So, for example, in pediatrics, asthma is a really, really big challenge. It's one of the leading reasons why children are admitted to the emergency room. You would be very interested in a type of patient monitoring technology that could be used with those frequent flyers may be at home to keep them from bouncing back into the ER. In contrast, COPD and heart failure are much bigger respiratory issues for older populations. So, you would be inclined to look at new types analytic platforms and patient monitoring tools that could help that. The hardware is going to be relatively similar across the different populations, but it's really what you do with the information for that appropriate patient that's going to make a difference.

**Wong:**

I agree, certainly sifting through all that data, which might not have been available without using patient monitoring, is now available once those patient monitoring devices are in place. Any further thoughts, Melissa and Priyanka, on this?

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**Powell:**

So, I would like to comment on something that Charlie said. I think that the key of really being able to put in a unit that is truly successful is its versatility. So, I can give an example that we're able to train staff on the unit and it's able to be used differently with different patients or even at the same patient at different times during their stay. And, I think that once you're able to get staff familiar with a unit and how it works, they're able to really customize the patient experience. If that patient's needs fall monitoring when they first come in, well then we can use that setting. But, as they progress and they become more independent, then they come off. The same thing with wound care as their wounds heal and get better, or they get stronger and they're able to turn and position themselves, well maybe the staff isn't going in and doing the work, but you're reminding the patients and you're able to monitor that the patient is successful done that. So, it's very valuable to be able to be able to progress the patient experience through the monitoring system.

**Wong:**

A great observation and that's really adapting the monitoring devices to the patient need, which is an excellent point. Looking at the monitoring technologies that are out there, are there improvements to this technology that you'd want to see in the future?

**Shah:**

Absolutely. So, a better understanding and a consensus on which parameters is necessary to identify or predict levels of clinical events, like sepsis or general deterioration would be helpful. Having data from these systems is big. But, I would also like to see is how hospitals would get meaningful data and use this to their advantage.

**Wong:**

Great point!

So thank you Melissa, Priyanka, and Charlie for your great insights into continuous patient monitoring. I hope that clinicians, hospital executives, and risk managers hearing this podcast will find your advice, recommendations and experience to be useful in helping them select the most appropriate patient marketing device for their clinical needs. So, thank you so much for joining me on this podcast.

**Panel:**

Thank you for having us! Thank you!