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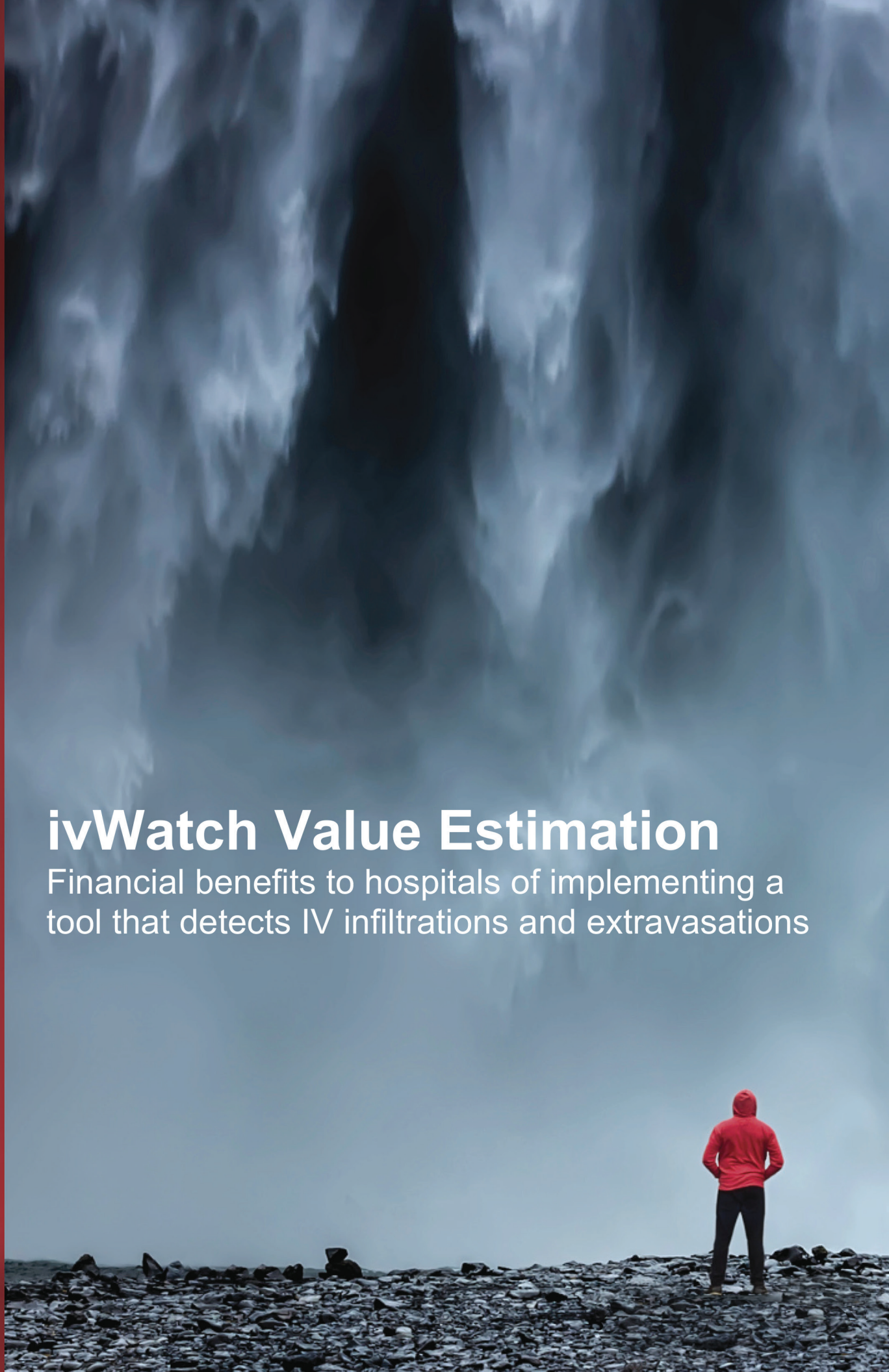


ivWatch Value Estimation

Financial benefits to hospitals of implementing a tool that detects IV infiltrations and extravasations

Introduction

Nearly every patient admitted to a hospital and many of those in outpatient settings receive a peripheral intravenous (IV) line. About half of those lines fail and about a quarter of those failures are severe extravasations, in which medication intended for the patient's vein is instead leaked into surrounding tissue.

In such cases, not only is the original treatment goal of the IV not achieved, but significant complications can also arise, requiring additional hospital days and remedial care. This means that over one out of every 20 patients entering the hospital may face pain, extra days away from home, and even life-altering injuries from a routine procedure.

From a purely mission-oriented perspective, this is unacceptable. However, these unchecked high rates of extravasation can also have large negative financial effects on hospitals. Extravasations drive longer hospital stays, transfers to the ICU, and often require costly additional care ranging from providing antidotes and wound debridement to fasciotomies, skin grafts, and even, in rare cases, amputations. This unnecessary care is often not reimbursed.

High rates of extravasations also drive down satisfaction scores, which can result in loss of hospital revenue; for example, patients begin to choose competitors for shoppable services or contracts with pay-for-performance elements reduce payouts in response to lower patient satisfaction scores.

In addition, high rates of peripheral IV failures may encourage some clinical staff to overuse central lines, a more costly procedure that carries its own failure risks, including the potential for central line-associated blood infections (CLABSI). CLABSI rate is one of the measures that can earn a hospital a Medicare reimbursement penalty if it drops below the 25th percentile, and thus overuse of central lines and overexposure to CLABSI risk can have potentially large financial effects.

Most significantly, severe extravasations can lead to costly medical malpractice lawsuits. Such lawsuits and the accompanying settlements, trial verdicts, and other legal costs have proliferated over the past several years. Though the typical cost of such a lawsuit is in the mid-six figures, it is not unheard of for a single judgment to net a seven- or even eight-figure liability.

Investment in preventing such extravasations is likely justified on a financial basis, but until relatively recently, there were limited options for addressing this issue beyond additional staff training and maintenance of a highly experienced nursing group. These are challenging paths, as hospitals still face nursing shortages and high nurse turnover. With these challenges in mind, ivWatch has developed a medical device that detects IV extravasations at an early stage, preventing over 90% of the more severe complications.

In support of efforts to increase the distribution of these devices, improve patient care, and reduce risk for hospitals, Aon has partnered with ivWatch to model the financial benefits of reducing extravasations through ivWatch implementation.

A typical 150-bed hospital is likely to have an annual financial return from implementing ivWatch of $8.9M-$13.4M for a pediatric hospital or $5.1M-$7.9M for a non-pediatric hospital. This is primarily driven by reductions in expected liability costs, with significant contributions from savings associated with avoiding uncompensated remedial care. Improvements in satisfaction and reductions in overuse of central lines are more minor contributors to expected value.

Aon Model: Overall Structure and Assumptions

Aon's modeling of ivWatch's benefit is rooted in its experience supporting health systems in managing risk and based on its proprietary data concerning the frequency and severity of healthcare professional liability costs, costs associated with post-extravasation remedial care, and hospital financial metrics.

Aon's analytical approach focused on the four categories of extravasation-related cost noted above: 1) the cost of remedial care, 2) lost revenue due to satisfaction reductions, 3) extra cost and risk associated with overuse of central lines, and 4) the risk of liability cost. The approach to evaluating each of these categories and the projected value created is described separately below. These categories were analyzed within a common set of underlying assumptions.

All analyses here are based on a 150-bed pediatric hospital with an annual net patient revenue of approximately $275M, 35% of which is driven by outpatient services.

Such a hospital is likely to see just under 1,500 severe extravasations per year, representing about 5% of encounters. This assumes that approximately 46% of admitted patients will receive a peripheral IV with a high-risk drug, 56% of those IVs will fail, 50% of those failures will be extravasations, and 53% of those extravasations will be severe (levels 3 or 4). After ivWatch implementation, the proportion of severe extravasations drops to 4%. This is based on actual third-party validated results ivWatch product has achieved in a pediatric hospital (van Rens, et al. 2025).

The number of extravasations and the severity of those extravasations is likely to be less at a non-pediatric-focused hospital. In Aon's model, it is assumed that both the total number of extravasations and the proportion of severe extravasations are 15% lower in a general hospital than in the pediatric setting.

Data Sources

Aon relied on three proprietary data sources in the development of this model.

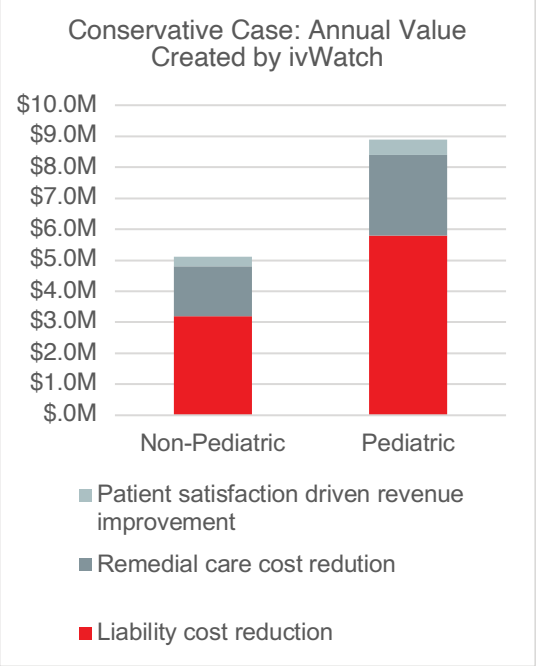
Hospital liability survey: Aon conducts a annual survey of hospitals across the United States quantifying the frequency and severity of healthcare liability costs across a range of categories, including IV-related incidents. These data include judgment amounts as well as legal costs. The liability cost savings in Aon's modeling are drawn from these data.

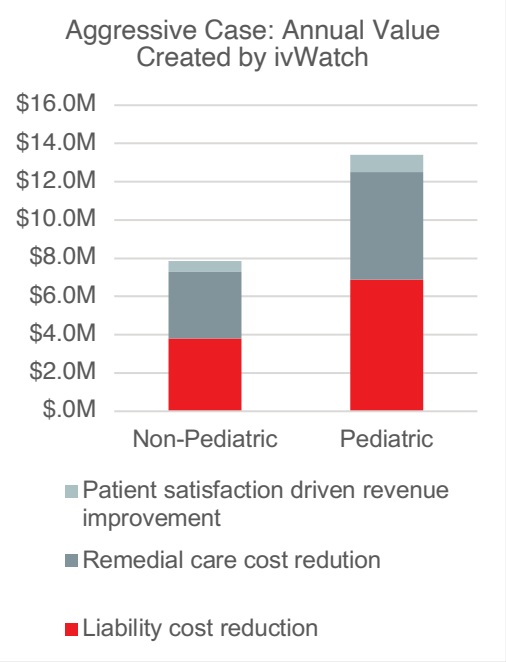
Procedure cost data: Aon has developed a proprietary database of the costs associated with each CPT code at the provider and payer levels. For the purposes of this model, the costs associated with a select set of CPT codes associated with post-extravasation remedial care were averaged at the national level.

Hospital financial data: Typical hospital margins were drawn from proprietary Aon benchmarking data and used to estimate the hospital cost-lines associated with the revenue figures obtained through Aon's CPT code database.

Overall Results

For a typical 150-bed pediatric hospital, Aon's model projects margins of $8.9M to $13.4M driven by ivWatch implementation, with an ROI of 9x to 14x, conservatively. For a non-pediatric hospital, the value-driven range conservatively is $5.1M-$7.9M, with an ROI of 7x to 9x.





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Results: Reduced Liability Cost

Description

Severe extravasations can lead to painful and even life-altering injuries and thus are often associated with lawsuits.

Avoiding severe extravasations can create value related to liability costs in several ways.

Most health systems retain a significant amount of risk for professional liability costs. Much, if not all, of the costs associated with extravasation judgments may thus be borne by the hospital itself. Avoiding these costs is a direct financial and reputational benefit.

In addition, to the extent that hospitals do insure some losses above a certain aggregate or event-specific level, reducing the likelihood of high-cost judgments that are likely to trigger this insurance can enable hospitals to raise their deductible without raising expected liability, and thus receive a significant reduction in professional liability premium costs.

Finally, a small but real subset of severe extravasations can result in truly catastrophic judgments, potentially costing hospitals tens of millions of dollars for a single incident. Further reducing the likelihood of these low-frequency but extremely high-severity incidents can allow hospitals to hold less capital against such events and can provide for stability and flexibility in the financial planning process.

Key Variables and Assumptions

The projected value from reduced liability costs is largely driven by the distribution of judgment frequency and size, including litigation costs. The distributions used to model ivWatch's benefits are based on a proprietary annual Aon survey of U.S.-based health systems that separately gauge judgment frequency and size by state and hospital type. Liability costs vary widely by region, driven by state-level regulations, regional litigation cultures, and even the presence of specific law firms. The results described here are based on average nationwide numbers; more region-specific numbers are available upon request.

The frequency of lawsuits is assumed to range between 0.9% of extravasations yielding a lawsuit to 1.05% of extravasations yielding a lawsuit, reflecting a conservative range relative to the frequency observed in Aon's survey sample. The average severity of lawsuits, including litigation costs, is approximately $400,000.

The current insurance structure is also a critical assumption. In the results described here, Aon has assumed a $5,000,000 deductible, reflecting the trend toward hospitals retaining most healthcare professional liability risk.

Results

A 150-bed pediatric hospital with about a third of its revenue coming from outpatient services can expect to achieve annual liability cost reductions, inclusive of reduced judgments, legal fees, and insurance costs, between $5.8 and $6.9M, conservatively.

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A 150-bed adult hospital with about a third of its revenue coming from outpatient services can expect to see annual liability cost reductions, inclusive of reduced judgments, legal fees, and insurance costs, between $3.2M and $3.8M, conservatively.

Results: Reduced Costs of Uncompensated Remedial Care

Description

When a severe extravasation occurs, it often requires time- and cost-intensive treatment. Fluid build-up due to extravasation may drive compartment syndrome, requiring a fasciotomy. To the extent that extravasation has caused necrosis of surrounding tissue, wound debridement may be necessary. Skin grafts may be required when skin necrosis occurs. If damage is particularly extensive, minor or major amputations may be necessary. This additional medical care often requires additional days in the inpatient setting and, in severe cases, in the ICU.

Often, much of this care is not compensated. Thus, eliminating severe extravasations and reducing the need to provide such often-uncompensated care represents significant value. Importantly, this model only includes the costs of remedial care likely to be provided within the original inpatient stay or immediately following the outpatient procedure in which an extravasation occurred. It does not occur the additional, potentially significant, care that may be required downstream, such as physical therapy and treatment for emotional distress. Such costs are more likely to be captured in litigation costs, and thus including them in the remedial care costs may result in doublecounting.

Key Variables and Assumptions

The value a given hospital derives from reducing uncompensated remedial care is driven by a few key variables. The largest driver is the extent to which the hospital's payer partners will reimburse it for care necessitated by a severe IV extravasation. Many insurers and third-party administrators follow policies that reduce or eliminate reimbursement for such events. However, the specifics and the enforcement of these policies may vary. In environments where strict non-payment policies are enforced, avoiding severe extravasations is more financially valuable to hospitals than in environments where hospitals are often compensated for remedial care. For the purposes of this analysis, Aon assumed that a range of 15% to 33% of such care would be reimbursed.

Another set of key drivers is the costs to the hospital associated with remedial care. Higher costs associated with such care predictably indicate greater value in avoiding it. The costs of this care vary widely across hospitals. The ranges used in Aon's model are included in **Table 1.**

The value realized from avoiding remedial care also depends on the typical contribution margin a hospital would net from such care if it were reimbursed. The lower the contribution margin relative to the cost, the more value a hospital will realize, regardless of how much of this care is ultimately reimbursed. Aon has assumed a typical 48% contribution margin for this model.

Table 1.

Procedure	Hospital Cost Line	Frequency After Severe Extravasation
Hospital Day	2,000	10% change of 2 extra days
ICU Day	5,000	5% increased chance
Major Amputation	3,300	0.05%
Minor Amputation	2,800	0.1%
Antidote	125	90%
Skin Graft	2,000	20%
Debridement	800	45%
Fasciotomy	3,000	20%
CLABSI	48,000	n/a
Central Line	1,600	n/a
Peripheral IV	290	n/a

Results

Aon's analysis estimates that hospitals are likely to realize $2.6M to $5.6M in incremental annual margin improvement through reductions in costs associated with remedial care in a pediatric setting, and $1.6M to $3.5M in an adult setting. These numbers are net of the expected revenue losses from reimbursed remedial care. The lower value number represents a scenario in which the hospital is reimbursed for 33% of such care, while the higher value number represents a scenario in which the hospital is reimbursed for 15% of such care.

Results: Improved Satisfaction

Description

Patients are more likely to rate a hospital highly if they do not experience complications during their course of care, and overall patient satisfaction scores are significantly correlated with hospital revenue, with some analyses showing that for each 10-percentage point increase of scores at the highest levels of satisfaction, hospitals can expect to see a 1.5% improvement in revenue (Berkowitz, et al 2021; Giese, et al 2023). Though the studies identifying this correlation attempted to control for other factors driving revenue, it is unlikely that all of this correlation represents a causal relationship. However, at least a portion of this effect is likely causal; satisfaction scores are highly-visible and can drive physician referrals and patient decisions regarding high-revenue elective procedures. In addition, many payer contracts include pay-for-performance clauses that are sensitive to changes in patient satisfaction scores.

Extravasations represent a relatively high proportion of the complications patients experience, and thus reducing them can have an appreciable effect on the total number of complications experienced and on overall satisfaction scores, and, ultimately, on revenue.

Assumptions

Aon's analysis assumes that patients who experience complications are about half as likely to provide a top satisfaction rating for a hospital. This is informed by the literature but is likely a highly conservative estimate of the likelihood of severe extravasations resulting in lower satisfaction ratings.

In addition, though the literature has demonstrated a 1.5% revenue improvement for every 10-point increase in top satisfaction score, Aon's analysis conservatively assumes that more than 50% of this revenue improvement represents non-causal correlation, and thus only increases revenue by 0.7% for each 10-point increase in top satisfaction score.

Results

For the typical hospital in this example, Aon's analysis projects between $500K and $900K in annual revenue improvement in a pediatric setting and in an adult setting $310K to $560K due to patient satisfaction improvements post ivWatch implementation, depending on whether individuals who experience extravasation complications are 50% to 90% less likely to provide a top satisfaction score.

Results: Reduction in Central Line Overuse

When clinicians are concerned about the complication rates of peripheral IVs, they may default to using central lines even when they are not called for. This creates additional cost, as placing a central line is more complex than a peripheral IV. It also creates its own opportunities for complications in the form of central line-associated blood infections (CLABSI).

These are dangerous and costly complications and can be particularly meaningful for a hospital as a CLABSI rate that puts an organization in the bottom 25th percentile of CLABSI avoidance can result in a 1% reimbursement decrement from CMS. Increasing clinician confidence in peripheral IV reliability can reduce central line overuse and thus reduce such costs and risks.

Assumptions

Aon's analysis is based on a conservative assumption that only 1% of central lines are likely to be shifted to peripheral IVs due to the increased confidence in peripheral IVs inspired by ivWatch implementation.

The analysis also relies on cost assumptions around peripheral IVs vs. central lines, which are outlined in **Table 1.**

Results

Aon's analysis expects minimal incremental value for most hospitals associated with a reduction in central line overuse, with less than $10K in saved costs annually. This is largely by its assumption that such overuse is not prevalent in most hospitals.

However, for the subset of hospitals that are on the brink of CLABSI rates that would place them in the bottom 25th percentile of quality scores, this may indeed be a significant source of value. For such a hospital with $275M in revenue, 50% of it from CMS sources, about $1.4M in annual revenue is at stake.

Conclusion

Implementing ivWatch creates significant value for hospitals, and several different factors drive this value. While liability cost reduction is the largest source, reductions in uncompensated remedial care and revenue increases due to improved patient satisfaction also contribute. Thus, even hospitals unlikely to derive value from one of these sources due to unique circumstances are still likely to realize appreciable value from the others.

In addition, these sources of value manifest over a complementary range of timelines. Reduction in uncompensated remedial care is likely to be realized quickly, as those costs are incurred when the extravasations happen. Improvements in revenue driven by patient satisfaction will take longer to develop as quality scores are published and word-of-mouth recommendations spread. Liability cost reductions may develop over a longer timeline as lawsuits take time to prepare and determine the final outcomes of these adverse events. Users of ivWatch can thus expect both near-term and sustained value.

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