FROST & SULLIVAN

Technology Leadership Award

EMS Communications Platform

NORTH AMERICA

Contents

Background and Company Performance

Industry Challenges

In North America, the lack of adequate communication between first responders and affiliate hospitals significantly impedes both patient care and provider revenue. Despite an often pressing need for clinical context, especially when it comes to treating complex conditions or repeat patients, Emergency Medical Services (EMS) rarely have access to hospital-based electronic health records (EHRs). At the same time, irregular connectivity leads to incomplete or delayed electronic patient care records (ePCRs). The result is a lack of vital information such as past medical history[1]—negatively impacting hospital-level care coordination while increasing charting time and error risk.[2]

Worse yet, the historical absence of technological solutions for sharing data across the ambulance bay-emergency department threshold leads to some 49.2% of critical prehospital data lost at each node of handoff.[3] Care provider anecdotes suggest that this information loss can rise closer to 80%. The result is not only increased time to treatment—which raises the risk of injury to the patient and liability to the care providers—but also increased costs if and when care must be restarted. Some hospitalists have therefore questioned the value of prehospital data to a receiving facility.

But others, including Michael Grill, Director of Prehospital Services for the South Denver EMS Team at Centura Health, one of Colorado's largest hospital systems, have suggested that technology can close the gap by ensuring timely and accurate information handoff. According to Grill, "Trauma systems in the US are resourced to provide the highest level of care for the most critical trauma patients...In 2016, local EMS activated Centura Health's South Denver trauma system 262 times; yet approximately 50% of these patients—once assessed and treated in the ED—were discharged without requiring further in-patient services. This represents a huge and unnecessary expenditure of resources—resources that could be used for patients who do require the highest level of care but instead must be diverted to another facility further from the accident scene. Every trauma activation called into our trauma center generates a rapid response of hospital personnel awaiting EMS arrival. Hospital staff access to critical information before patient arrival, such as the actual mechanism of the crash [in the case of vehicular accidents], number and demographic of [a vehicle's] occupants, past medical history, medications, etc., is almost non-existent. Such information known prior to patient arrival would accelerate patient care and treatment while simultaneously reducing the potential for iatrogenic errors such as administering medications contraindicated due to hospital staff being unaware of what medications a patient is currently taking."

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[1] Goldberg SA, Porat A, Strother CG, et al. *Quantitative analysis of the content of EMS handoff of critically ill and injured patients to the emergency department.* Prehosp Emerg Care. 2017:21(1);14–17.

[2] The Joint Commission. (n.d.) *Sentinel event data: root causes by event type 2004–2015.* HNX Healthcare Update. Retrieved Nov. 20, 2017, from https://hcupdate.files.wordpress.com/2016/02/ 2016-02-se-root-causes-by-event-type-2004-2015.pdf.

[3] Talbot R and Bleetman, A. *Retention of information by emergency department staff at ambulance handover: do standardised approaches work?* Emerg Med J. 2007 Aug; 24(8): 539–542.

Time-sensitive scenarios that require the receiving hospital to activate a specialized care team before arrival are particularly vulnerable. According to Troy Hagen, past president of the National EMS Management Association and CEO of Care Ambulance Service-Falck USA, the world's largest ambulance operator, inaccurate and inadequate documentation further costs providers $3 billion per year in lost revenue.[4] Enhanced communication is also necessary to identify and monitor patients who receive opiates and amphetamines as prehospital care units usually lack context such as pharmacological history. Consequently, the ability to collect and correlate data from disparate and multiple healthcare resources is the key to intervention on behalf of addicts.

Vendors who can provide streamlined software that allows for the rapid bi-lateral entry and transmission of vital information to both the emergency department (ED) and first responders will experience increased market share. Frost & Sullivan notes that while data interoperability is critical to improving efficiencies, the United States (US) National EMS Information System (NEMSIS) and Health Level 7 International (HL7) standards do not provide adequate real-time data transfer as the manner in which each was architected fails to support data exchange with one another. Vendors who can integrate data via a health information exchange (HIE) that allows for interoperability will provide a powerful value proposition. Proven, evidence-based offerings are in high demand, with key success factors including data integrity, streamlined file searches, and customization capabilities that address client needs.

MEDIVIEW™'s 2019 Cross-Platform Edition Splash Screen for iOS, Android, and Windows

Source: Beyond Lucid Technologies
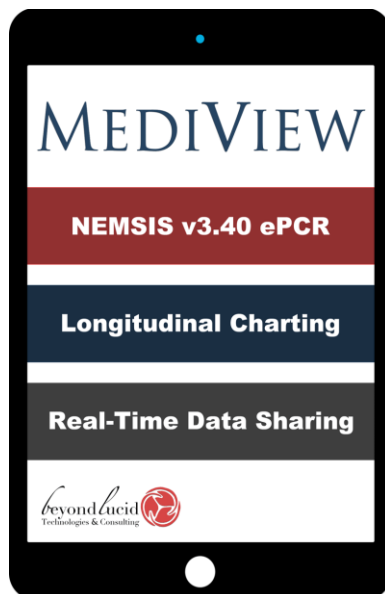
Beyond Lucid's Technology Leverage and Business Impact

Founded in 2009 at Carnegie Mellon University's Tepper School of Business and headquartered in Concord, California, Beyond Lucid Technologies, Inc. (Beyond Lucid) is an award-winning health-and-safety information technology firm serving a range of first responders. The company's proprietary MEDIVIEW™ ePCR and Prehospital HIE (MEDIVIEW™) provides end-users efficient and cost-effective communications that promote clinical awareness, logistical support, and quality assurance regarding mission-critical data. Specifically, the company's software-as-a-service platform connects users with the care facilities they serve—allowing transmission of vital information needed by EMS and fire department crews before they arrive on the scene while also sending the data to the receiving hospital with the patient in route.

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[4] https://www.emsworld.com/article/10754651/value-ems

Additionally, if the patient is enrolled in a care management program such as community paramedicine (i.e., mobile integrated health) for readmission avoidance or intervention of opioid and opiate addiction, the prehospital crew may need help deciding whether or not to transport the patient.

Frost & Sullivan acknowledges that MEDIVIEW™ optimizes patient record quality, data sharing, and analysis—allowing for the frequent tracking of EMS users, including patients addicted to opioids, opiates, and amphetamines. Currently Beyond Lucid's differentiated prehospital documentation platform uniquely charts emergent, acute, and chronic care simultaneously. Furthermore, the company's ability to connect the entire prehospital care ecosystem through real-time patient data collection combined with an innovative user experience design provides a strong competitive advantage. Trade journals highlighting Beyond Lucid's resilient technology indicate its efficacy for high-demand scenarios such as inconsistent network access. While it is faster and lower-cost to build online-only apps, MEDIVIEW™'s proprietary and purpose-built architecture empowers continual data streams and utilizes a "store and forward" mechanism to minimizing network downtime, supporting continuous operations even during maximum system stress scenarios such as earthquakes, tornadoes, hurricanes, major wildland fires, and in austere rural contexts. Other best practices include using Amazon Web Services (AWS) to ensure nationwide reach with minimal latency as well as the ability to accommodate almost any capacity instantaneously. The company can also merge multiple records generated offline, thereby enabling disparate data reconciliation and dispatches while ensuring patient records are intact, auditable, and HIPAA-compliant.

Furthermore, Beyond Lucid is the only prehospital documentation technology with the ability to convert data from any NEMSIS-compliant ePCR platform to HL7-structured Continuity of Care Documents in real-time. As a result, EHR transmission and integration occurs in as little as 30 seconds. Frost & Sullivan notes this is a vast improvement over competitors who can only funnel data when records are closed out—up to a 72-hour process given normal Fire and EMS shift schedules.

The company's technology allows all major EHRs to integrate high-quality ePCR data, and there is no need for retrofitting. Frost & Sullivan notes that the company's client base is rapidly growing due to its proven ability to deliver significant clinical, operational, and financial gains. Other EMS market leaders that have leveraged the MEDIVIEW™ BEACON Prehospital HIE to share data between prehospital providers, care facilities, and EMS regulatory agencies include leading companies such as Medusa Medical Technologies, Zoll Data, and HealthEMS (a division of Stryker Corporation). In 2017, Beyond Lucid's ePCR platform was licensed and white-labeled by FIREHOUSE Software, at the time a division of Conduent Government Services (formerly Xerox Government Services). At present, Beyond Lucid serves Fire departments, ground and air EMS agencies, community paramedicine providers, and medical transportation services in 23 states, as well as their affiliated hospitals, non-hospital care facilities (such as nursing homes), and billing companies.

Major metro areas in which Beyond Lucid has active clients include Boston, Chicago, Cincinnati, Columbia, South Carolina; Denver, Hartford, Houston, Kansas City, Missouri; Oakland, Sacramento, San Francisco and Toronto, Canada.
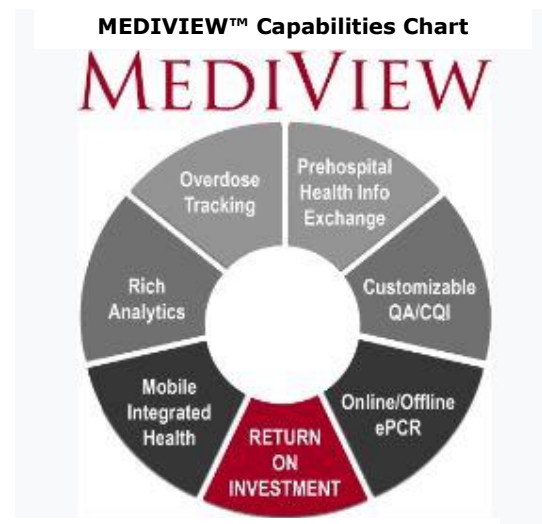
Setting a New Standard

Among Beyond Lucid's key innovations is the ability to employ artificial intelligence (AI) to determine where to transport patients based on factors such as the patient's condition, logistical factors such as weather and traffic, and hospital capabilities and capacities. The company's MEDIVIEW™ BEACON Prehospital HIE, currently deployed in over a dozen states and able to be implemented in a matter of hours (rather than months or longer in the case of competitive offerings), provides a dashboard display of key data points that are relevant to a receiving facility, such as impression, scene departure time, age, and gender. A record search capability

MEDIVIEW™ Capabilities Chart

Source: Beyond Lucid Technologies

also displays previous patient trips. MEDIVIEW™ provides full offline operation as well as integrated analytics, reporting, and customization capabilities. Beyond Lucid's MEDIVIEW™ TRIPS / T.R.I.O. offering provides integrated dispatch and scheduling capabilities in addition to documentation over time, with TRIPS focused on non-acute patients, and T.R.I.O. mainly geared to intervention on behalf of acute-care patients who are known to be addicted to harmful substances and therefore run a high risk of overdose.

Frost & Sullivan recognizes that Beyond Lucid's technology operates as middleware, facilitating collaboration among firms who would otherwise be competitors. Specifically, MEDIVIEW™ can be layered agnostically onto any underlying ePCR, eliminating the need to displace incumbents. Rather, firms such as FIREHOUSE, Medusa Medical, and HealthEMS (part of Stryker), can incorporate the MEDIVIEW BEACON Prehospital HIE into their suite of branded market offerings. According to EMS Chief Kim Roderick of the Palo Alto Fire Department, "The intriguing concept from Beyond Lucid is…they're thinking about what the hospital needs are, physician needs are, EMS needs are, state and county requirements, back-end, quality improvement, running reports. The whole gamut." As a pioneer and thought leader, Beyond Lucid was the first in the industry to integrate telemedicine into the MEDIVIEW™ ePCR, allowing for rapid wound site documentation, insurance, and patient identification.

Frost & Sullivan's independent analysis confirms that other company innovations include:

- The first ePCR to comply with NEMSIS;

- The first to track patients longitudinally from the ePCR, enabling readmission avoidance as well as the identification and proactive care of repeat patients;

- The first to link an ePCR and a third-party Fire Record Management System (RMS).

Beyond Lucid excels at customer service, offering quick issue resolution and industry-leading response times. It also has a flexible business model that includes a low-cost option and affordable customization—a key success factor as approximately 25% of the company's client base is rural with limited resources. Frost & Sullivan research reveals that Beyond Lucid's profitability and cost-effective technology allows it to undercut competitors. According to Lydia Theurer, CAC, CADS, EMT-P, former Lieutenant and current CERT Program Manager at Atchison County, Kansas, EMS: "You can definitely tell a difference in a company whose heart is in it and a company who is just out to make a buck. We purchased Beyond Lucid's ePCR software in January 2018…they have never taken more than 24 hours to answer a question. And any issues we have had (which have been minor and few), they fixed immediately. Their software is so user-friendly and EMS-friendly; they seem to understand that we are on the go and this needs to be taken into consideration. Our reports were taking on average 30 to 45 minutes with our previous software and (we are) now completing them in 15 minutes, (which) is totally reasonable. I have been an EMT/paramedic for over 16 years and used several different software types, and I would recommend this system to anyone."

According to Matt Miller, owner and director of Miller EMS, one of the fastest-growing EMS agencies in Oklahoma: "Our company experienced rapid growth since going into business in 2008. We, therefore, needed a patient care reporting solution that let our administrative team focus on the company and where it was going. With patient care reporting as the backbone of our company's viability, shortfalls from other programs were pulling our administrative team away from other important tasks. Until we found MEDIVIEW, nothing really fit our needs. Other systems lost data, file searches were cumbersome, and vendors wanted to tell us what was best for us, rather than really listening and addressing our needs. The BLT team worked with us for several months to ensure that their product was tailored to us. They delivered on every request we had and allowed ample time for our administrative team and field personnel to work with the program. We plan to continue growing and plan to rely on MEDIVIEW for the long haul, especially as we integrate even more closely with our local hospitals."

Future Focus

Beyond Lucid is leveraging its ever-expanding footprint and longevity to move into global markets. Presently the company is penetrating markets across Texas and New England, and is exploring an opportunity in the Middle East with a large national ambulance service provider. Current clients include government contractors to develop software for community paramedicine applications and the US Department of Justice, with Beyond Lucid recently winning a contract to help track and aggregate data for an opiate rehabilitation program.

Frost & Sullivan notes that Beyond Lucid's purpose-built technology such as the use of AWS architecture enables rapid scalability—important as the company anticipates strong growth in 2019. A virtual company culture further allows for excellence by tapping into hotbeds of technical talent. As a result, Beyond Lucid's employees hail from institutions such as MIT and Carnegie Mellon University. The company's next phase is to leverage its expertise and growing prehospital interoperability network to help connect vehicles involved in a crash

with emergency responders, thereby providing critical health details to care providers even before they arrive at the crash scene.

MEDIVIEW™ ePCR Tempates: A Single Button Push Can Select 100+ Required Data Elements

Source: Beyond Lucid Technologies

Conclusion

Inadequate communication between caregivers during emergency transport can lead to delays and negative patient outcomes, including death. Beyond Lucid Technologies' (Beyond Lucid) innovative MEDIVIEW™ platform automates provider access to patient information before arrival—saving critical minutes supporting time-sensitive and lifesaving clinical interventions. The company's resilient technology layers on top of electronic patient care record systems, enabling open collaboration with minimal cost, effort, and downtime. With its best-in-class interoperability, real-time data sharing capabilities, and exceptional thought leadership, Beyond Lucid Technologies earns Frost & Sullivan's 2019 North American Technology Leadership Award in the EMS communications platform market.

Significance of Technology Leadership

Technology-rich companies with strong commercialization strategies benefit from the increased demand for high-quality, technologically-innovative products. Those products help shape the brand, leading to a strong, differentiated market position.

Understanding Technology Leadership

Technology Leadership recognizes companies that lead the development and successful introduction of high-tech solutions to customers' most pressing needs, altering the industry or business landscape in the process. These companies shape the future of technology and its uses. Ultimately, success is measured by the degree to which a technology is leveraged and the impact that technology has on growing the business.

Key Benchmarking Criteria

For the Technology Leadership Award, Frost & Sullivan analysts independently evaluated two key factors—Technology Leverage and Business Impact—according to the criteria identified below.

Technology Leverage

Criterion 1: Commitment to Innovation
Criterion 2: Commitment to Creativity
Criterion 3: Technology Incubation
Criterion 4: Commercialization Success
Criterion 5: Application Diversity

Business Impact

Criterion 1: Financial Performance
Criterion 2: Customer Acquisition
Criterion 3: Operational Efficiency
Criterion 4: Growth Potential
Criterion 5: Human Capital

Best Practices Recognition: 10 Steps to Researching, Identifying, and Recognizing Best Practices

Frost & Sullivan Awards follow a 10-step process to evaluate Award candidates and assess their fit with select best practice criteria. The reputation and integrity of the Awards are based on close adherence to this process.

STEP		OBJECTIVE	KEY ACTIVITIES	OUTPUT
1	**Monitor, target, and screen**	Identify Award recipient candidates from around the globe	• Conduct in-depth industry research • Identify emerging sectors • Scan multiple geographies	Pipeline of candidates who potentially meet all best-practice criteria
2	**Perform 360-degree research**	Perform comprehensive, 360-degree research on all candidates in the pipeline	• Interview thought leaders and industry practitioners • Assess candidates' fit with best-practice criteria • Rank all candidates	Matrix positioning of all candidates' performance relative to one another
3	**Invite thought leadership in best practices**	Perform in-depth examination of all candidates	• Confirm best-practice criteria • Examine eligibility of all candidates • Identify any information gaps	Detailed profiles of all ranked candidates
4	**Initiate research director review**	Conduct an unbiased evaluation of all candidate profiles	• Brainstorm ranking options • Invite multiple perspectives on candidates' performance • Update candidate profiles	Final prioritization of all eligible candidates and companion best-practice positioning paper
5	**Assemble panel of industry experts**	Present findings to an expert panel of industry thought leaders	• Share findings • Strengthen cases for candidate eligibility • Prioritize candidates	Refined list of prioritized Award candidates
6	**Conduct global industry review**	Build consensus on Award candidates' eligibility	• Hold global team meeting to review all candidates • Pressure-test fit with criteria • Confirm inclusion of all eligible candidates	Final list of eligible Award candidates, representing success stories worldwide
7	**Perform quality check**	Develop official Award consideration materials	• Perform final performance benchmarking activities • Write nominations • Perform quality review	High-quality, accurate, and creative presentation of nominees' successes
8	**Reconnect with panel of industry experts**	Finalize the selection of the best-practice Award recipient	• Review analysis with panel • Build consensus • Select recipient	Decision on which company performs best against all best-practice criteria
9	**Communicate recognition**	Inform Award recipient of Award recognition	• Announce Award to the CEO • Inspire the organization for continued success • Celebrate the recipient's performance	Announcement of Award and plan for how recipient can use the Award to enhance the brand
10	**Take strategic action**	Upon licensing, company is able to share Award news with stakeholders and customers	• Coordinate media outreach • Design a marketing plan • Assess Award's role in future strategic planning	Widespread awareness of recipient's Award status among investors, media personnel, and employees

The Intersection between 360-Degree Research and Best Practices Awards

Research Methodology

Frost & Sullivan's 360-degree research methodology represents the analytical rigor of our research process. It offers a 360-degree-view of industry challenges, trends, and issues by integrating all 7 of Frost & Sullivan's research methodologies. Too often companies make important growth decisions based on a narrow understanding of their environment, leading to errors of both omission and commission. Successful growth strategies are founded on a thorough understanding of market, technical, economic, financial, customer, best practices, and demographic analyses. The integration of these research disciplines into the 360-degree research methodology provides an evaluation platform for benchmarking industry players and for identifying those performing at best-in-class levels.

360-DEGREE RESEARCH: SEEING ORDER IN THE CHAOS

About Frost & Sullivan

Frost & Sullivan, the Growth Partnership Company, enables clients to accelerate growth and achieve best-in-class positions in growth, innovation and leadership. The company's Growth Partnership Service provides the CEO and the CEO's Growth Team with disciplined research and best practice models to drive the generation, evaluation and implementation of powerful growth strategies. Frost & Sullivan leverages more than 50 years of experience in partnering with Global 1000 companies, emerging businesses, and the investment community from 45 offices on six continents. To join our Growth Partnership, please visit http://www.frost.com.

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