

The research has begun, and initial findings address several of the priority research questions. Here's a summary of the current evidence, organized by your research plan:

Current State Evidence

1. What percentage of patients currently discharge before noon? (need national benchmarks)

- One source indicates that a facility had about 4.5% of patients discharged by 11:00 AM, with national benchmarks suggesting a possibility of 20-30% by 11:00 AM.
- Another study showed an increase in discharges by noon (DBN) from 9.5% at baseline to 26.8% through interventions.
- A pediatric setting reported an increase in patients discharged before 11 am from 7% to 19% through interventions.

2. How does discharge timing vary by hospital type, size, location?

- Limited direct information found on variation by hospital type, size, or location in the initial search results. One study focused on a pediatric setting.

3. What is the hourly distribution of discharges throughout the day?

- One result mentions "Histograms for the number of patients discharged accordingly to the hour of the day by year of study," but the specific distribution is not immediately clear from the snippet. It does note that the nurse duty shift is at 7 PM. Another study refers to "peak hours" (5 pm to 11 am for non-peak, implying other hours are peak for discharges and room turnover).

Impact Quantification

1. How does discharge timing affect ED boarding?

- Improved timing of inpatient discharges *could* positively affect ED boarding, and this can be tested with computer modeling.
- High hospital occupancy, often exacerbated by delayed discharges, increases ED boarding times, leading to overcrowding.
- ED boarding time is impacted by a lack of available hospital beds due to multiple factors, including overcapacity.
- Expediting patient discharge, including through "early rounding and discharges prior to noon," is a strategy to create additional hospital bed capacity and improve patient flow, thus addressing ED boarding.

2. What is the financial impact of delayed discharges?

- **Increased Length of Stay (LOS):** Directly inflates average LOS for patients who are medically cleared.
- **Reduced Bed Capacity:** Beds remain unnecessarily occupied, limiting new admissions and leading to lost revenue.
- **Emergency Department (ED) Bottlenecks:** Leads to longer ED wait times, potential diversions, and lost revenue from new admissions.
- **Coordination Conflicts:** Postponement of surgeries and procedures due to lack of beds.
- **Increased Resource Costs:** Hospitals incur higher costs (staff time, medical supplies) without corresponding reimbursement increases.
- **Staff Overtime:** Can skyrocket due to bottlenecks.
- **Reimbursement Challenges:** Fixed reimbursement rates mean longer stays due to delays eat into profit margins.
- **Potential Readmission Penalties:** Rushed discharges to clear beds can lead to complications and readmissions, impacting value-based care payments.
- **Opportunity Costs:** Resources tied up in managing delays could be used for value-added activities.
- Addressing discharge delays can unlock substantial financial benefits.

3. How does it affect patient satisfaction and outcomes?

- The discharge process is the final step in a hospital stay and significantly impacts patient satisfaction.
- Any delay or dissatisfaction in the discharge process can result in low patient satisfaction and negatively affect the hospital's image.
- One study found that post-discharge contacts within 7 days were *not* associated with a reduction in 30-day hospital readmissions, ED use, or patient satisfaction. However, this focused on post-discharge follow-up, not the in-hospital discharge timing itself.
- One study that improved early discharges saw no significant changes in patient satisfaction with the discharge process, while another study that increased DBN saw reductions in Risk Adjusted Length of Stay (RA-LOS) and Risk Adjusted Readmissions, suggesting improved outcomes.

4. Impact on hospital capacity and throughput?

- Delayed discharges directly reduce bed capacity and impede patient flow (throughput).
- Improving the timeliness of discharge for medically ready patients can significantly impact hospital capacity and throughput.
- Discharge from acute care can be a significant rate-limiting step for patient flow, impacting transfers from ICUs and intermediate care units.
- Promoting earlier discharges (e.g., before rounds, evening discharges) can open beds for admissions and transfers.
- Implementing an "Expediting Team and Departure Lounge" to remove barriers to discharge can lead to sustained improvements in earlier discharges, decreased lengths of stay, and smoother transitions in care, thus improving throughput and capacity.

Root Cause Analysis

1. What are the primary barriers to early discharge?

- **Physician-related:** Physicians caring for other patients, heterogeneity in physician rounding styles (e.g., prioritizing sickest patients first, room-by-room, or newest patients

instead of those ready for discharge), high hospitalist workload (census), and balancing teaching/education responsibilities.

- **Clinical factors:** Awaiting consultant recommendations, completion of care by social workers, procedures, labs, radiology, therapy services, and home oxygen.
- **Documentation/Process:** Preparation of discharge summary, clearance of files from various departments, incomplete documentation.
- **Staffing/Coordination:** Overburdened junior residents, untrained nursing staff, lack of manpower, lack of coordination among nursing staff and junior residents.
- **Patient/Family factors:** Awaiting a ride, patient counseling (though this is part of the process).
- **Extrinsic factors (often perceived as dominant but sometimes less so):** Insurance authorization issues, placement issues.
- **Lack of planning:** Not planning for discharge early enough.

2. How much time does each step in the discharge process take?

- One study found the mean duration of the discharge process to be 372 minutes (approx. 6 hours 12 minutes).
- Preparation of discharge summary: mean time of 248 minutes (approx. 4 hours 8 minutes).
- Completing files: mean time of 164 minutes (approx. 2 hours 44 minutes).
- General expectation: most people should expect to be discharged within two hours of being ready, though more complex cases may take longer.

3. What are the differences between high and low performers?

- High-performing hospitals often implement **effective discharge planning** which includes:
 - Improved communication between health and social care.
 - Thorough assessment and planning for discharge.
 - Adequate notice of discharge.
 - Involvement of patient and family.
 - Multidisciplinary teams (MDTs) for discharge planning: formal, often weekly meetings to coordinate care, make decisions, and ensure continuity. They break down barriers, foster common purpose, clarify responsibilities, and identify leads.
 - Discharge coordinators: experienced nurses taking lead responsibility for strategic planning and inter-organizational coordination. They build relationships with care

- agencies to navigate and align processes.
 - Standardized discharge criteria and checklists.
 - Nurse-initiated conditional discharge orders.
 - Prioritizing rounding on patients ready for discharge.
- Low performers likely exhibit the opposite of these characteristics, such as poor communication, lack of planning, inadequate involvement of patients, and reliance on fragmented processes.

Intervention Effectiveness

1. Which interventions have proven successful?

- **Multidisciplinary rounds (MDRs):** Proven successful (detailed below).
- **Standardized discharge criteria/checklists:** Improve timeliness.
- **Nurse-initiated conditional discharge orders:** Encourage team-based, patient-centered care.
- **Expediting teams and Departure Lounges:** Address clinical and non-clinical barriers, free up inpatient capacity.
- **Prioritizing rounding on discharge-ready patients:** Allows for earlier discharge orders.
- **Promoting evening discharges:** Spreads out the workload.
- **Implementing a system for accurate predictive insights:** (discussed in detail below).
- **Assigning a day-to-day operational performance leader.**
- **Developing a coordinated system-wide patient discharge process.**
- **Identifying patient discharge barriers and recommended actions for each stakeholder.**
- **Eliminating communication silos.**

2. What is the evidence for multidisciplinary rounds?

- MDRs are a valuable tool for improving quality, safety, and patient experience.
- Many hospitals have achieved reduced patient days, reduced central line days, and increased coordination of care through MDRs.
- They emphasize safety and efficiency, allowing team members to offer expertise and contribute to patient care.

- MDRs improve communication and collaboration, adherence to process measures, and patient outcomes.
- Formal studies have found similar results, including improved compliance with IHI ventilator bundles and expedited discharge planning.
- They provide a formal mechanism for daily communication regarding safety risks and daily goals.
- MDRs facilitate protocol/guideline use and understanding.
- **Specifically for early discharge:** MDRs, especially discharge-focused ones, have proven to minimize avoidable delays near discharge. When combined with predictive analytics, they can further decrease hospital length-of-stay.

3. Role of technology and predictive analytics?

- **Predictive analytics** uses data modeling and machine learning to estimate when a patient is ready for discharge and predict readmission risks. This leads to more informed, timely, and personalized discharge decisions.
- **Machine-learning-based discharge prediction models** can support multidisciplinary rounds and decrease hospital length-of-stay. One study found a reduction in LOS of over 12 hours on medicine and telemetry units when incorporating these predictions.
- Predictive insights help identify high-priority patients, save time in prioritizing discharges, and enable pre-planning for future discharges.
- An **operations management platform** that uses intelligent automation (AI, workflow automation, streamlined communication) can provide past, present, and future insights into hospital operations, supporting sustainable improvements. This platform can deliver real-time information, recommend actions, and eliminate communication silos.
- Technology can enable a "single source of truth" for all cross-functional areas to identify and address critical priorities and barriers.

4. Sustainability of improvements?

- Many project-based initiatives to improve discharge practices are short-lived and fail to sustain long-term results.
- Sustainability requires:
 - **Integrating improvements into daily culture:** Moving beyond project-based initiatives.
 - **System-wide approach:** Viewing the discharge process as a connected approach throughout patient care progression, understanding its impact on the entire

enterprise.

- **Accurate predictive insights:** To anticipate census and identify likely discharges, enabling coordination.
- **Real-time information and recommended actions:** To address and eliminate barriers.
- **Eliminating communication silos:** Using a single source of truth for all cross-functional areas.
- **Assigning a dedicated operational performance leader** with authority to gather data, break down barriers, and implement improvements.

Next Steps:

The initial search provided a good foundation. To further strengthen the research, I will now focus on:

- **More recent national benchmarks for discharge by noon rates:** While 20-30% was mentioned, more current and granular data would be beneficial.
- **More specific data on hourly discharge distribution:** Beyond the mention of histograms.
- **Studies directly comparing discharge timing across different hospital types/sizes/locations.**
- **More quantitative financial analyses:** Beyond the qualitative description of financial impacts.
- **Time-motion studies:** To further break down the discharge process beyond the average times identified.
- **Specific examples of successful RCTs or quality improvement studies:** To extract concrete data points on interventions, achieved improvements, and sustainability.
- **Case studies from high-performing hospitals:** To understand the practical implementation of successful strategies.

I will continue using the defined search terms and explore the identified key journals.

The research is progressing well, providing a good amount of information across your priority questions. Here's an updated summary, incorporating the new findings and identifying areas for deeper dives:

Research Plan for Discharge by Noon Issue - Research Update

Priority Research Questions

1. Current State Evidence

- **What percentage of patients currently discharge before noon? (need national benchmarks)**
 - One study (published 2024, data 2010–2018 in Florida) found that statewide, the average percentage of patients discharged before 12 noon was **13.0% (\pm 0.28% SE)**. Only 4.5% of hospitals reliably achieved a morning weekday discharge rate \geq 20.0%. Only 9.4% achieved \geq 50.0% before 3 PM. The median hour of discharge was 3 PM. This is a strong benchmark for a specific state.
 - Intervention studies provide "baseline" rates:
 - One study increased DBN from **9.5% to 26.8%**.
 - Another increased discharges before 11 am from **10.0% to 27.1%**.
 - A "Very Important Discharge Appointment" (VIDA) intervention saw 67% of patients discharged before noon in the intervention group, compared to 6% in the control group.
 - **Further need:** While the Florida data provides a valuable benchmark, finding more recent national benchmarks (2020–2024) that might capture shifts due to new initiatives or electronic health record (EHR) adoption would be beneficial.
- **How does discharge timing vary by hospital type, size, location?**
 - The Florida study (2010–2018) provides some insights into location (statewide Florida data).
 - Another study, focusing on discharge summary quality, presented data by "Hospital Location" (Micropolis, Metropolis, Division), "Teaching status" (Major, Minor, Non-teaching), and "Hospital size by number of beds" (<200, 200–499, >499). While this isn't directly about discharge *timing* variation, it highlights that such characteristics *can* be analyzed.
 - One study on occupancy levels and discharge timing in Queensland, Australia, noted "choke points" (performance decline as occupancy increased) were "dependent on hospital size."
 - **Further need:** More direct evidence explicitly linking variations in discharge *timing* (e.g., % before noon) to hospital type (e.g., academic vs. community), size (number of beds, census), and location (urban vs. rural, different regions) would be valuable.

- **What is the hourly distribution of discharges throughout the day?**
 - The Florida study explicitly states the median hour of patient discharge was **3 PM** and that there was no change in the percentage of patients discharged before 12 noon (13.0%) or before 3 PM (42.2%) from 2010 to 2018. This suggests a significant skew towards afternoon discharges.
 - One study noted that "hospital discharges frequently occur in the afternoon or evening hours."
 - **Further need:** While the 3 PM median is a strong data point, visual representations (histograms) or more detailed breakdowns of hourly discharge volumes across multiple hospitals would provide richer context.

2. Impact Quantification

- **How does discharge timing affect ED boarding?**
 - Confirmed: Delayed discharges exacerbate ED boarding and overcrowding. Increased DBN is associated with earlier and evenly spread-out arrival of admissions on inpatient floors from the ED. Computer modeling can test this hypothesis.
 - ED boarding time is impacted by lack of available hospital beds due to multiple factors, including overcapacity, staffing, and room requirements.
 - Expediting discharge creates additional hospital bed capacity, which directly alleviates ED boarding.
- **What is the financial impact of delayed discharges?**
 - **Quantified examples:**
 - One study at a Level I trauma center estimated total hospital charges for excess days due to discharge delays at **\$2,455,703 per year** and total costs at **\$715,403 per year**. This study suggested the main cause was limitations in post-hospital care.
 - Another source cited an NHS (England) estimate of approximately **£100 million per year** in costs associated with delayed discharge, attributed to occupying beds, nursing staff, and administrative costs.
 - Patients experiencing delays had an average daily hospital charge of **\$2935**.
 - **Qualitative impacts (confirmed):** Increased LOS, reduced bed capacity, ED bottlenecks, postponed surgeries/procedures, increased resource costs (staff time, medical supplies), staff overtime, negative impact on profit margins due to fixed reimbursement rates, potential readmission penalties, and significant opportunity costs.
- **How does it affect patient satisfaction and outcomes?**
 - **Patient Satisfaction:** Delayed discharge can lead to low patient satisfaction and negatively affect the hospital's image, as it is the final, well-remembered step of the hospital stay. One study that *improved* discharge time saw no significant change in

patient satisfaction, which implies that satisfaction might not automatically increase with faster discharges unless other factors (e.g., communication, perceived readiness) are also addressed.

- **Outcomes:** Increased DBN has been associated with reductions in Risk Adjusted Length of Stay (RA-LOS) and Risk Adjusted Readmissions. Patients boarding in the ED for longer periods have been shown to experience functional decline post-discharge.
- **Impact on hospital capacity and throughput?**
 - Confirmed: Delayed discharges significantly limit bed availability, causing inefficient throughput and insufficient capacity.
 - Earlier discharges are a key strategy to improve patient flow and open beds for admissions and transfers.
 - Strategies like prioritizing discharges, promoting evening discharges, and implementing expediting teams and departure lounges directly contribute to improving capacity and throughput.

3. Root Cause Analysis

- **What are the primary barriers to early discharge?**
 - **Intrinsic (within hospital control):** Physician rounding styles (not prioritizing discharge-ready patients, heterogeneity in styles), physician workload/census, awaiting consultant recommendations, care completion by social workers, procedures, labs, radiology, therapy services, home oxygen setup.
 - **Process/Communication:** Incomplete documentation, time taken for discharge summary preparation and file clearance, lack of planning, untrained nursing staff, lack of manpower, communication gaps/lack of coordination among staff.
 - **Extrinsic (often outside direct hospital control, but requiring coordination):** Awaiting a ride, insurance authorization, placement in post-acute care facilities (identified as a major cause of delay in trauma centers).
- **How much time does each step in the discharge process take?**
 - Average discharge process duration: **372 minutes (approx. 6 hours 12 minutes)**.
 - Preparation of discharge summary: **248 minutes (approx. 4 hours 8 minutes)**.
 - Completing files: **164 minutes (approx. 2 hours 44 minutes)**.
 - Time from discharge order to patient leaving the room: decreased by **22.7% from 2.2 hours to 1.7 hours** in one Six Sigma intervention.
 - **Further need:** While averages are good, more detailed time-motion studies that break down non-value-added time or specific delays within these steps would be highly beneficial.
- **What are the differences between high and low performers?**
 - High performers prioritize and implement structured discharge planning early,

involving multidisciplinary teams, clear communication, standardized processes (checklists, conditional orders), and often leverage technology. They focus on identifying and addressing barriers.

- Low performers likely struggle with these areas, leading to fragmented processes, poor communication, and reactive management of discharges.
- **Further need:** Direct comparisons or case studies explicitly detailing the *differences in practice* between identified high and low performing hospitals would be impactful.

4. Intervention Effectiveness

- **Which interventions have proven successful?**
 - **Multidisciplinary rounds (MDRs):** (detailed below)
 - **Structured discharge appointment processes** (e.g., VIDA): Showed a patient 30.6 times more likely to be DBN.
 - **Prioritizing rounding on discharge-ready patients first** and writing discharge orders early (e.g., before 10 am).
 - **Multidisciplinary approach** involving nursing, providers, case management, social work, and therapy.
 - **Six Sigma methodology:** Reduced discharge time by 22.7% (from 2.2 to 1.7 hours) and hospital LOS (from 3.4 to 3.1 days).
 - **Expediting Team and Departure Lounge:** Improved early discharges, decreased LOS, smoother transitions.
 - **Standardized discharge criteria/checklists and nurse-initiated conditional discharge orders.**
 - **Integrating discharge planning into care management, addressing non-medical needs, building teamwork, engaging family/caregivers.**
 - **Project BOOST (Better Outcomes by Optimizing Safe Transitions):** Lowered 30-day readmission rates (from 14.7% to 12.7%).
- **What is the evidence for multidisciplinary rounds?**
 - Strong evidence for improving communication, teamwork, coordination of care, adherence to process measures, and patient outcomes.
 - Lead to reduced patient days, reduced central line days, and expedited discharge planning.
 - Discharge-focused MDRs minimize avoidable delays.
 - Combining MDRs with machine-learning-based discharge predictions can decrease LOS (e.g., over 12 hours reduction on medicine/telemetry units).
- **Role of technology and predictive analytics?**
 - **Predictive analytics:** Estimates patient readiness for discharge and predicts readmission risk, enabling timely, personalized decisions.
 - **Machine-learning-based discharge prediction models:** Support MDRs and

directly reduce LOS. Features with highest predictive value included elapsed LOS, lab/medication counts, mobility assessments, and acute kidney injury measures.

- **Intelligent automation platforms:** Provide insights, streamline communication, eliminate silos, identify high-priority patients, and facilitate pre-planning.
- **Sustainability of improvements?**
 - Many project-based initiatives are short-lived.
 - Sustainability requires:
 - Integrating improvements into daily culture.
 - A coordinated system-wide process.
 - Accurate predictive insights and real-time information with recommended actions.
 - Eliminating communication silos (single source of truth).
 - Strong leadership with authority to drive and sustain change.
 - Continuous quality improvement (QI) methodologies (e.g., PDCA, Lean Six Sigma) are crucial for sustained change by clarifying root causes and creating consistent processes.

Next Steps

The research has yielded significant insights. To conclude, I will synthesize the findings into a comprehensive report addressing each priority question, drawing direct quotes and data points where available. I will explicitly state where further research might be beneficial but acknowledge that for the scope of this project, the current findings are substantial.

Specifically, I will now focus on synthesizing the gathered information into the final report structure. I have sufficient information for all priority research questions based on the executed searches.