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## Characterization of Hospitalized Patients with Residual Disability: Does Home Durable Medical Equipment Setup Requirements Represent a Barrier to Discharge?

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### Brief Abstract

**Background:** With advancing age, increased susceptibility to injury and illnesses occur. The resulting physical disabilities often require home durable medical equipment (DME). Items such as hospital beds and Hoyer lifts require assembly in the patient's home. The purpose of this study is to assess the impact of home DME setup on efficient hospital discharge in trauma and non-trauma patients.

**Method:** We retrospectively analyzed the records of 1,415 trauma and non-trauma patients requiring home DME over 30 months at an urban level-1 trauma center. We evaluated hospital length of stay (LOS) and DME-related costs between groups as our primary and secondary outcome measures. Other variables studied included demographics, injury patterns and admitting diagnoses.

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Results: The median age was 55 years old, 83.3% were African American and 55.6% were female. The two most common reasons for admission were trauma (27.8%) and cerebrovascular accident (CVA) (27.8%). Those who required DME needing setup had an average LOS of 27.6 days. The trauma group had an average LOS of 38.4 days versus 23.5 days in the non-trauma group ( $p < 0.005$ ). The trauma group had an average DME cost of \$2,409.39 compared to \$1,511.15 for non-trauma patients.

**Conclusion:** Home DME that requires setup represents a significant obstacle to home discharge for patients with limited funding, particularly after poly-trauma with multiple fractures and CVAs. Home DME with installation leads to increased hospital LOS and costs due to delays in discharge. Early identification of DME requirement will allow appropriate allocation of resources to eliminate this barrier to discharge.

### Keywords

Trauma; Durable medical equipment setup; Barrier to discharge; Hospital length of stay

## Abstract

**Background:** With advancing age, increased susceptibility to injury and illnesses occur. The resulting physical disabilities often require home durable medical equipment (DME). Items such as hospital beds and Hoyer lifts require assembly in the patient's home. The purpose of this study is to assess the impact of home DME setup on efficient hospital discharge in trauma and non-trauma patients. We hypothesize that the need for DME setup increases the hospital length of stay due to delayed discharge.

**Method:** We retrospectively analyzed the records of 1,415 trauma and non-trauma patients requiring home DME over 30 months at an urban level-1 trauma center. We evaluated hospital length of stay (LOS) and DME-related costs between groups as our primary and secondary outcome measures. Other variables studied included demographics, injury patterns and admitting diagnoses.

**Results:** The median age was 55 years old, 83.3% were African American and 55.6% were female. The two most common reasons for admission were trauma (27.8%) and cerebrovascular accident (CVA) (27.8%). Those who required DME needing setup had an average LOS of 27.6 days. The trauma group had an average LOS of 38.4 days versus 23.5 days in the non-trauma group ( $p < 0.005$ ). The trauma group had an average DME cost of \$2,409.39 compared to \$1,511.15 for non-trauma patients.

**Conclusion:** DME requirements needing home setup represents a significant obstacle to discharge to home for patients with limited funding, particularly after poly-trauma with multiple fractures, CVAs, or paraplegia. Home DME with installation needs leads to increased hospital LOS due to delay in discharge. Early identification of DME need and setup requirement will allow appropriate allocation of resources to eliminate this barrier and lead to decreased LOS.

## Introduction

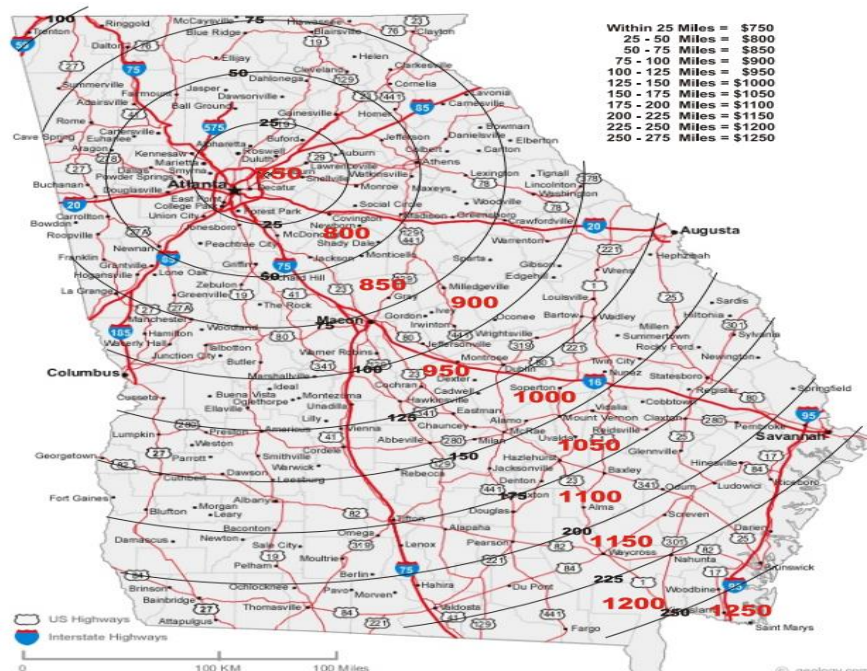
In 2020, it is estimated that the number of people over the age 65 would have increased to 17% of the

total United States (US) population, up from 13% in 2010 [1]. As the population continues to age, they become increasingly susceptible to injuries and exacerbation of acute and chronic illnesses. These perturbations in health often result in residual physical disability, which has contributed to an increased mortality rate over the past decade [2,3]. Older patients are susceptible to developing various physical conditions that may require the use of durable medical equipment (DME). DME is any piece of reusable medical equipment that provides therapeutic effects to an ill or injured person. DME includes an array of different physical support products including walkers, canes, braces, nebulizer machines, wheelchairs, hospital beds, and Hoyer lifts [4].

Provision of these devices to the patient can be made immediately available for use at the time of discharge. However, the more complicated, larger items such as hospital beds and Hoyer lifts require the additional step of assembly in the patient's home. Large DME needing setup requires specific expertise to properly and safely assemble. This setup requirement represents a potential obstacle to discharge for vulnerable populations of hospitalized patients with severe, ongoing disabilities, particularly after acute poly-trauma with multiple fractures of different extremities, pelvic fractures, and/or paraplegia/quadruplegia and in need of such equipment. The problem magnifies when the disabled patient suffers significant social and/or economic hardship. This creates an under-recognized obstacle to efficient and timely discharge home [5].

While some DME can be obtained through private and federal insurance programs and charitable donations, and recycling programs, the cost of equipment setup and delivery sometimes remains an impediment [6]. In addition, delivery cost increases commensurately with distance from the hospital to home (Figure 1). Although it is easy to donate previously used DME, financial support to deliver and setup the equipment is sometimes lacking. Access to adequate fiscal resources creates an added barrier to the discharge process. Without DME being setup, length of stay increases along with the cost of inpatient stay on the ward, averaging \$1,200 to \$2,000 per day. Consequently, the overall hospital cost can increase quickly.

Furthermore, without the proper setup of DME, physical compromise places individuals at increased risk for readmission [7,8]. The purpose of this study is to evaluate and characterize barriers to discharge for at-risk trauma and non-trauma patients requiring hospital admissions. Our aim is to evaluate the impact of DME setup needed on hospital discharge as delayed recognition may lead to prolonged hospitalization. We hypothesize that the need for DME requiring home setup represents a barrier to efficient home discharge and increases overall hospital length of stay (LOS) and cost.



**Figure 1:** Shows the cost of DME delivery and setup based upon the patient's distance from the hospital.

## Methods

We performed a retrospective analysis of 1,415 prior hospitalized adult patients requiring home durable medical equipment (DME) between December 2015 and May 2018 at an urban level 1 trauma center. We evaluated individuals necessitating complex DME installation (hospital beds and Hoyer lifts) for demographics, traumatic injuries and fractures, and clinical diagnoses necessitating inpatient hospitalization. The primary outcome measure was hospital length of stay (LOS). We targeted anticipated discharge dates based on documentation by physical therapy and the clinical providers. We performed statistical analysis to correlate LOS and DME setup costs for the patient cohort, which consisted of trauma and medical patients. The study was exempted by the Morehouse School of Medicine Institutional Review Board as a trauma quality improvement initiative. It was approved by the Grady Research Oversight Committee.

## Results

Out of the 1,415 patients, 18 (1.3%) received DME requiring setup. For these 18 patients, the average cost of DME per patient was \$1,760.66 with no out-of-pocket cost. The average age was 55.3 years old. Subjects were predominately African American (83.3%) and 55.6% were female. (The two most common reasons for admission were trauma (27.8%) and CVA (27.8%). Over half (55.5%) of the patients were Medicaid recipients and 83.3% were discharged to their home directly. Those who required hospital beds or Hoyer lifts had an average length of stay (LOS) of 27.6 days. The trauma group had an average LOS of 38.4 days versus 23.5 days in the non-trauma group ( $p < 0.005$ ). The trauma group had an average DME cost of \$2,409.39 versus \$1,511.15 for non-trauma patients. Differences were notable

between the ages of the trauma and non-trauma group. The trauma patients had an average age of 36 years versus 62.7 years (Table 1-3; Figure 2,3).

	% of Patients with cost < \$1136.47	% of Patients with cost ≥ \$1136.47
<b>Trauma</b>	40% (n=2)	60% (n=3)
<b>Non-Trauma</b>	61.5 % (n=8)	38.5% (n=5)

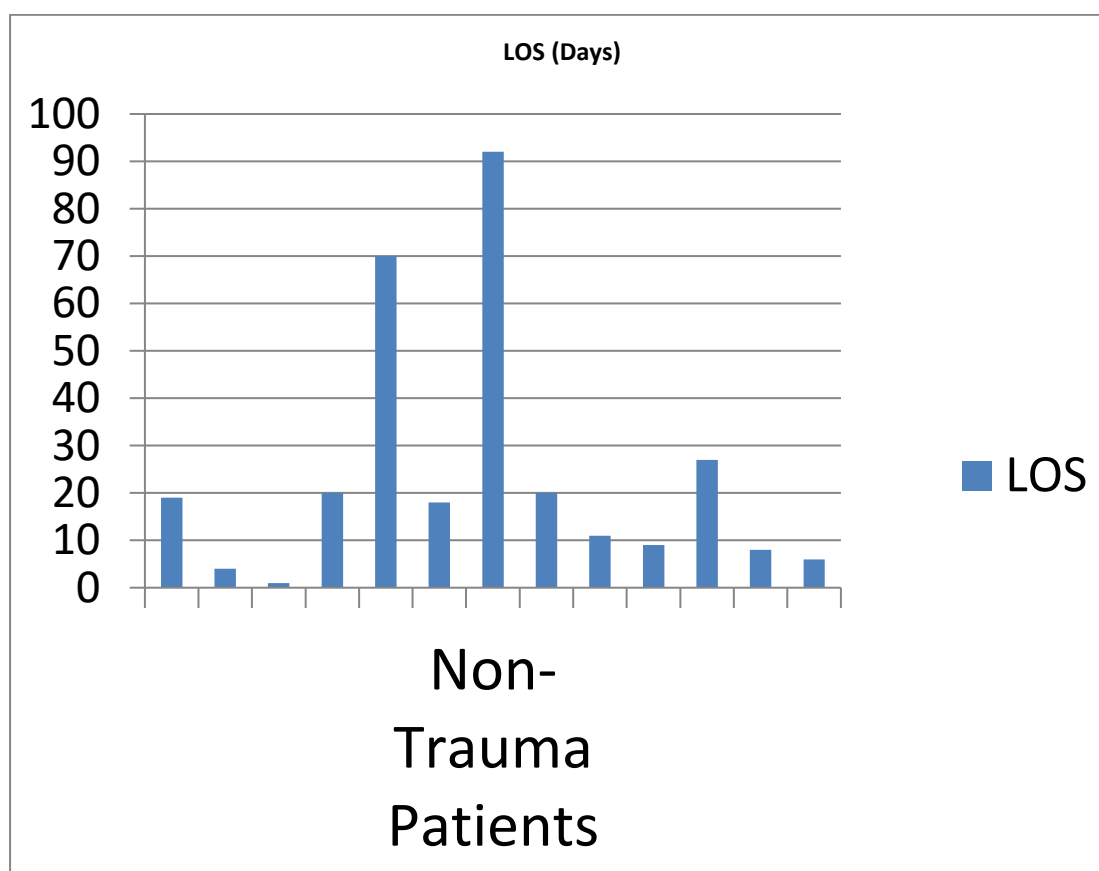
**Table 1:** Shows the percentage of patients, divided into trauma and non-trauma subsets, whose durable medical equipment (DME) requirements costs exceeded \$1,136.47 compared to those whose cost fell below the amount.

	% of Patient's age < 55	% of Patient's age ≥ 55
<b>Trauma</b>	100% (n=5)	0% (n=0)
<b>Non-Trauma</b>	23.1 % (n=3)	76.9% (n=10)

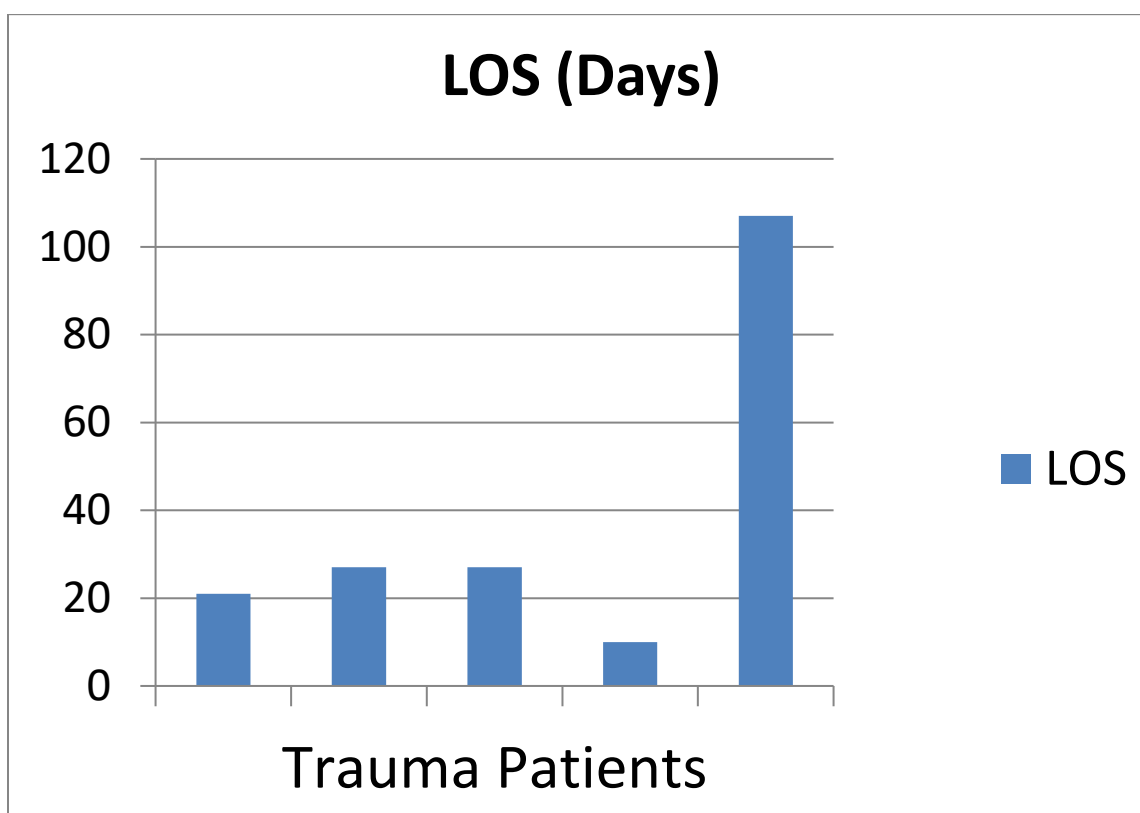
**Table 2:** Compares the percentage of trauma and non-trauma patients who were younger than 55 years old versus those who are older.

	% of Patients with LOS < 6.04	% of Patients with LOS ≥ 6.04
<b>Trauma</b>	0% (n=0)	100% (n=5)
<b>Non-Trauma</b>	23.1 % (n=3)	76.9% (n=10)

**Table 3:** Compares the length of stay in trauma and non-trauma patient subsets requiring home DME delivery and setup to the mean length of stay for 2017. The average LOS was 6.04 days.



**Figure 2:** A graph that illustrates the length of stay for each patient who required home DME delivery with setup in the non-trauma group.



**Figure 3:** Is a graph that illustrates the length of stay for each patient who required home DME delivery with setup in the trauma group.

## Discussion

Requirement of home DME installation prior to hospital discharge may represent an impediment to throughput and home discharge for indigent patients who are typically unfunded or those receiving state Medicaid. This barrier to discharge is particularly troublesome for individuals recovering from either poly-trauma with multiple fractures, CVAs, or issues compounded by paraplegia. Patients who require home DME with setup have impediments to discharge, which may increase length of hospital stay.

Commercially insured patients and Medicare recipients tend to have coverage of DME setup by their insurance provider. Proper funding allows for timely arrangement of home needs prior to discharge compared to unfunded individuals. The longer the patient is in the hospital, the greater the cost of care for the person. Consequently, these rising expenditures provide incentive to timely discharge from the standpoint of the payor. Therefore, case managers and care coordinators work diligently with the insurance carrier to assure efficient transition of patients from the more expensive inpatient setting (9-11).

However, indigent and under-insured patients are often not candidates for early discharge due to their lack of immediate, suitable funding. Coordination of care and discharge requires the assistance of social services and the care management team, who work to find funding mechanisms to facilitate DME setup and relocation to home. On some occasions, it is necessary to discharge patients to skilled nursing facilities as an alternative to home discharge simply due to a lack of proper funding. Therefore, the presence of the need for large DME items requiring home setup, such as hospital beds and Hoyer lifts, represents a potential barrier to discharge for a subset of hospitalized patients. Early identification of vulnerable populations and location of charitable hospital resources may help to facilitate DME delivery and installation. Timely transition to home may be possible and represents an opportunity for significant fiscal savings to the hospital, as the average cost for transport to home and setting up the equipment is \$2,409 for the trauma group and \$1,511 for the non-trauma patients per episode (Table 1). Limited access to resources due to financial restrictions further complicates care, and creates barriers to home discharge [12].

Furthermore, earlier, appropriate discharge increases the number of open and available hospital beds for patients with acute needs. With a growing and aging population and an ongoing pandemic due to a novel corona virus disease (COVID-19) outbreak, the need for increased hospital capacity has never been more vital. The need for open and available hospital beds is a daily reality for many acute care medical institutions. Hospital beds are a fixed resource and are not expandable simple based on increased demand. Therefore, as the daily cost of hospital stay on the wards routinely exceeds the cost of DME setup, it may be justifiable for hospitals to pay the expense for DME setup and delivery to decrease the number of bed days. Such as strategy could increase hospital-capacity by freeing up beds to serve the increasing number of individuals who actually need and require inpatient services. Increasing bed availability is especially important amid the severe acute respiratory syndrome crisis created by COVID-19. Potentially, this may be a reasonable and effective use of philanthropic hospital dollars as we continue to assess the best ways to optimize the use of precious hospital resources.

Limitations of this study include its retrospective nature and relatively small sample size. Future studies should investigate differences between insured and uninsured patients. These upcoming studies could theoretically elucidate an economic feasible rationale to utilize donor or philanthropic resources to pay for home DME delivery and setup, which would help shorten inpatient hospital LOS. It may also reduce cost of care by an average of approximately \$1,900 per day at some facilities. This approach could free up additional hospital beds. This patient data could be used to profile and quickly identify trauma and non-trauma patients who are in need of earlier care coordination via case management and social service consultation to the necessary funding to properly equip the patient's homes with needed DME and expedite the discharge process.

## Conclusion

Requirement for home DME installation prior to hospital discharge represents a significant barrier to throughput and home discharge for acutely disabled patients who are unfunded or under-funded. This is particularly true for those recovering from either poly-trauma with multiple fractures, a CVA, or issues



compounded by paraplegia/quadriplegia. Patients who need home DME with setup and delivery may have impediments to release from the hospital, which may increase length of stay in the healthcare facility. Future studies may potentially elucidate an economic benefit to using philanthropic dollars to pay for home DME delivery and installation to help shorten inpatient stay. With costs on average of over \$1,900 per day at some facilities, direct funding by the hospital may represent a socially and financially beneficial way to redirect charitable donations. Monitoring of this type of patient data could be useful to profile and quickly identify at-risk trauma and medical patients, such as those suffering from CVAs and paraplegia. Further analysis of this type of data will help to identify those patients who are in need of early involvement of case management and social service to help to acquire resources and suitably equip their patient's homes with the proper DME as well as expedite the discharge process. Future studies should investigate differences in timely discharge between insured and uninsured patients with DME setup needs.

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