



Rural Wisconsin
Health Cooperative

Density of HIT Adoption in Wisconsin Rural Hospitals

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Density of HIT Adoption in Wisconsin Rural Hospitals Executive Summary

This study has been conducted by the Wisconsin Office of Rural Health (WORH) and the Rural Wisconsin Health Cooperative (RWHC) in order to determine the levels of health information technology (HIT) system adoption in rural Wisconsin hospitals and to help rural facilities benchmark their HIT programs against those of their peer facilities.

This year's report shows a 10% increase (compared to 2006) in HIT systems implemented by rural Wisconsin hospitals. While still behind the overall State adoption averages, many rural hospitals have been implementing systems such as PACS, digital imaging, medication administration verification, CPOE, and others. The report also highlights the costs associated with operating an HIT program that involves a high level of HIT adoption: hospitals with 15 of the 20 systems identified in the survey had 71% higher HIT operating expenses than the average respondent hospital. As was reported in 2006, the smallest volume rural hospitals continue to have the lowest HIT adoption rates, with 23% fewer systems implemented than the average rural hospital.

Primary Conclusions

1. HIT adoption in rural Wisconsin hospitals is increasing at a steady pace, with adoption rates of identified systems going from 50% in 2006 to 60% in 2008. Also, many study participants noted plans for 2008-2009 implementations.
2. Even with these gains, only 18% of these rural hospitals had high rates of adoption (high is defined as 13-16 systems) compared to 40% of all Wisconsin hospitals (per 2008 WHA data on all Wisconsin hospitals).
3. Assistance from larger organizations is not predictive of IT adoption, with 12 of the top 13 adopters receiving no outside assistance from larger organizations.
4. Rural Wisconsin hospitals tend to opt for more integration in their HIT strategy, with 77% using an integrated strategy, 20% using a cluster strategy, and 3% using a best of breed strategy. Because they generally rely on their integrated vendors for interfacing, only 20% have implemented interface engines.
5. Rural Wisconsin hospitals generally lay a foundation of basic clinical systems before building to advanced patient safety systems, such as CPOE, e-MAR, medication verification, and nurse documentation (i.e. hospitals in general implement these advanced systems as capstone applications on top of significant preliminary HIT application work).
6. As we would expect, the more systems that were implemented, the more staff was employed to support them. Facilities with 12 or more systems employed

20% more FTEs than the average, and facilities with 15 or more systems employed 70% more FTEs than the average.

7. Corresponding to point #6, the more systems that were implemented the higher the facilities IT operating costs. Facilities with 12 or more systems spent 23% more to operate their IT programs than average. Facilities with 15 or more systems spent 71% more than average.
8. The smallest 1/3rd of rural respondents had 23% fewer systems implemented than the overall rural pool. This is likely because small hospitals have less capital and fewer IT FTEs, and HIT systems don't always scale down well, since ROI is generally dependent on volume. This disparity would have been 10% higher if not for projects funded by federal agencies (HRSA's CAHHITN and the FCC Pilot Program).

Policy Recommendations

1. Because of conclusions 2, 7, and 8, continue to fund rural hospital HIT: While it is promising to see HIT adoption increases from 2006 to 2008, the data also highlights the significant ongoing cost burden associated with the adoption of HIT systems, especially advanced clinical systems. For our smallest rural hospitals, this cost burden can be prohibitive. Policy makers should support the special IT needs of rural community hospitals by continuing to provide funding for programs that can help reduce disparities related to size and rurality and that can promote the rapid adoption of HIT systems for all community hospitals. HIT programs that benefit rural hospitals include but are not limited to: HRSA's CAHHITN, Flex, and SHIP programs, FCC's USF and Rural Healthcare Pilot Program, and USDA's DLT program.
2. When designing new programs or revising existing ones, policy makers should understand the realities of rural-HIT implementation, including those discussed in conclusions 4 and 5. Other factors, such as culture change, strategic planning, physician engagement, and core infrastructure issues all play a critical role in the process. New programs should be designed with sensitivity to proven rural HIT success factors and with reasonable implementation timeframes. (Aggressive hospital EHR implementations are usually phased-in over three to five years.)
3. While some strides have been made, there is in fact very little data that helps (1) small rural facilities understand rurally relevant HIT implementation strategies and (2) policy makers understand the unique qualities of rural HIT and issues associated. There is a need for additional data that both helps rural facilities make good HIT decisions and provides stakeholders with a broader picture of the national rural HIT landscape.

1. Introduction

This study has been conducted by the Wisconsin Office of Rural Health (WORH) and the Rural Wisconsin Health Cooperative (RWHC) in order to determine the levels of health information technology (HIT) system adoption in rural Wisconsin hospitals and to help rural facilities benchmark their HIT programs against those of their peer facilities.

Version 1 of this study was released in 2006 and is available at the following URL: <http://www.ruralcenter.org/documents/RWHC%20Density%20of%20HIT%20Adoption.pdf>. This year's study builds on the 2006 work by (1) adding new questions regarding HIT in hospital-owned physician clinics, long term care centers, and home health departments; and (2) incorporating new benchmarking data relating to IT FTEs, computer levels, and expenditure levels.

The 2006 study had 30 hospital respondents, which constitutes nearly half of rural Wisconsin hospitals. This year we have so far collected 29 responses. 17 of the responses are from 2006 participating hospitals; 12 are from first-time respondents. Facilities interested in participating and being added to this data pool (a valuable benchmarking opportunity for administrative teams and Boards) should contact Louis Wenzlow at RWHC (rwhc.com) or John Eich at WORH (worh.org).

2. HIT System Definition

Twenty systems were chosen for this study as indicative of HIT density. This is certainly not a comprehensive list of hospital electronic medical record (EMR) related systems, but it covers many of the key systems associated with the concept EMR, including systems that have demonstrated the potential to reduce medication errors, increase secure access to patient information at the point of care, and increase care coordination. Since there may be ambiguity as to the definition of a given system, the systems were defined as indicated below. The definitions aren't meant to be authoritative, but were developed to ensure the consistency of responses. Survey participants were instructed to answer "Yes" to the adoption questions if they had implemented or had purchased and were scheduled to implement the system within three months.

1. Admit/Discharge/Transfer (ADT) System (i.e. Registration System)

ADT systems are usually implemented in conjunction with patient accounting/patient billing systems and are often bundled with them. All hospitals will likely answer yes to this question.

2. Lab Information System (LIS)

A LIS handles the receiving, processing and storing of information generated by medical laboratory processes. A LIS usually interfaces with instruments and other information systems such as hospital information systems (HIS). Common features of a LIS include order entry, specimen processing, results entry and distribution, and reporting.

3. Pharmacy System (Inpatient)

An inpatient pharmacy system handles the receiving, processing, and storage of information generated by hospital pharmacy processes. A pharmacy system usually interfaces with other systems, such as HIS, lab, and/or medication dispensing systems. Common features of a pharmacy system include order entry, formulary management, medication profiles, and drug, allergy, and other contraindication checking capabilities.

An inpatient pharmacy system may or may not have (1) bedside medication verification, (2) e-MAR, and (3) CPOE capabilities associated. (These three applications are dealt with as separate items in this survey).

4. Radiology Information System (RIS)

A RIS is used by radiology departments to store, manipulate, and distribute patient radiological data. A RIS usually interfaces with other hospital systems, such as HIS and PACS. Common features of a RIS include patient tracking and scheduling, result reporting, and film tracking.

5. Interdepartmental Order Communications (i.e. Order Entry)

An interdepartmental order entry system allows for the electronic placement of orders between hospital departments, but will not necessarily facilitate practitioners placing their own orders (as with CPOE). A common example of this would be when ER and nursing department staff transcribe physician paper orders into the electronic order entry system. The orders are then transmitted to Lab, Radiology, Pharmacy, Respiratory, and other departments.

6. Hospital EMR Portal (i.e. Physician Portal or Clinical Data Repository)

An EMR Portal provides caregivers a structured view of hospital results and clinical data, including from all major ancillary systems. An EMR Portal usually interfaces with most systems that provide clinical information, and may interface with document imaging systems.

7. Computerized Radiography

CR uses very similar equipment to conventional radiography except that in place of a film to create the image, an imaging plate is used. Hence, instead of taking a film into a darkroom for developing in chemical trays, the imaging plate is run through a computer scanner to read and digitize the image. The image can then be viewed and enhanced using software that has functions very similar to conventional image-processing software, such as contrast, brightness, and zoom. (*definition from Wikipedia)

8. PACS (Picture Archiving and Communications System)

PACS automates the storage, retrieval, distribution, and presentation of digital radiology images. A fully implemented PACS has the capacity to

replace a radiology department's film-based operations. If you lease PACS from a vendor or another provider, please answer yes and note this in the comments field.

9. Nursing Documentation System (Inpatient Charting)

Nursing documentation systems allow for the electronic input of patient information (usually right at the bedside using wireless computers on wheels—COWs), including initial interviews, patient progress notes, assessments, vital signs, and other documentation.

10. e-MAR (Electronic Medication Administration Record)

Though e-MAR and bedside medication verification with medication barcoding have often been used interchangeably, for our purposes e-MAR is not related to barcoding. The e-MAR allows caregivers and pharmacists to collaboratively use and update the patient MAR in real time, allowing for the elimination of a paper MAR environment. E-MAR is often implemented in conjunction with a nursing documentation and/or pharmacy system.

11. Bedside Medication Verification System

A bedside medication verification system requires the barcoding of medications in unit dose. Once the system is implemented, caregivers use barcode readers at the bedside to scan the barcoded medication and the patient identification band to verify that the right patient is getting the right medication at the right time.

12. Medication Dispensing System

An automated medication dispensing system is a drug storage device or cabinet that electronically dispenses medications in a controlled fashion and tracks medication use. Most of these systems require user identifiers and passwords, track nurses accessing the system, track the patients for whom medications are administered, provide special controls for narcotics, and provide reporting features.

13. Computerized Practitioner Order Entry (CPOE)

CPOE is a process of electronic entry of physician instructions for the treatment of patients (particularly inpatients) under his or her care. These orders are communicated to the medical staff (nurses, therapists or other physicians) or to the departments (including pharmacy, laboratory or radiology) responsible for fulfilling the order. CPOE can decrease delay in order completion, reduce errors related to handwriting or transcription, allow order entry at point-of-care or off-site, and provide error-checking for duplicate or incorrect doses or tests (*Definition from Wikipedia).

14. Surgery Management System

A surgery management system automates the scheduling, supply ordering, and resource monitoring functions in a surgery department. The system

replaces surgery pick lists and preference cards, so that the items on these lists/cards can be automatically charged to patient accounts as they are used, and reports can be generated to facilitate restocking.

15. Document Imaging (Bulk Scanning)

Document imaging is the online storage, retrieval and management of electronic images of documents. The main method of capturing images is by scanning paper documents.

16. Interface Engine

Some hospitals rely on their application vendors to create point to point interfaces with other systems, but some have invested in interface engines to control the movement of the data themselves. Examples of commonly used interface engine vendors include Cloverleaf, SeeBeyond, and Orion.

Respondents were also asked whether they had implemented:

17. Physician Practice Management Systems,

18. Physician Practice EMR Systems,

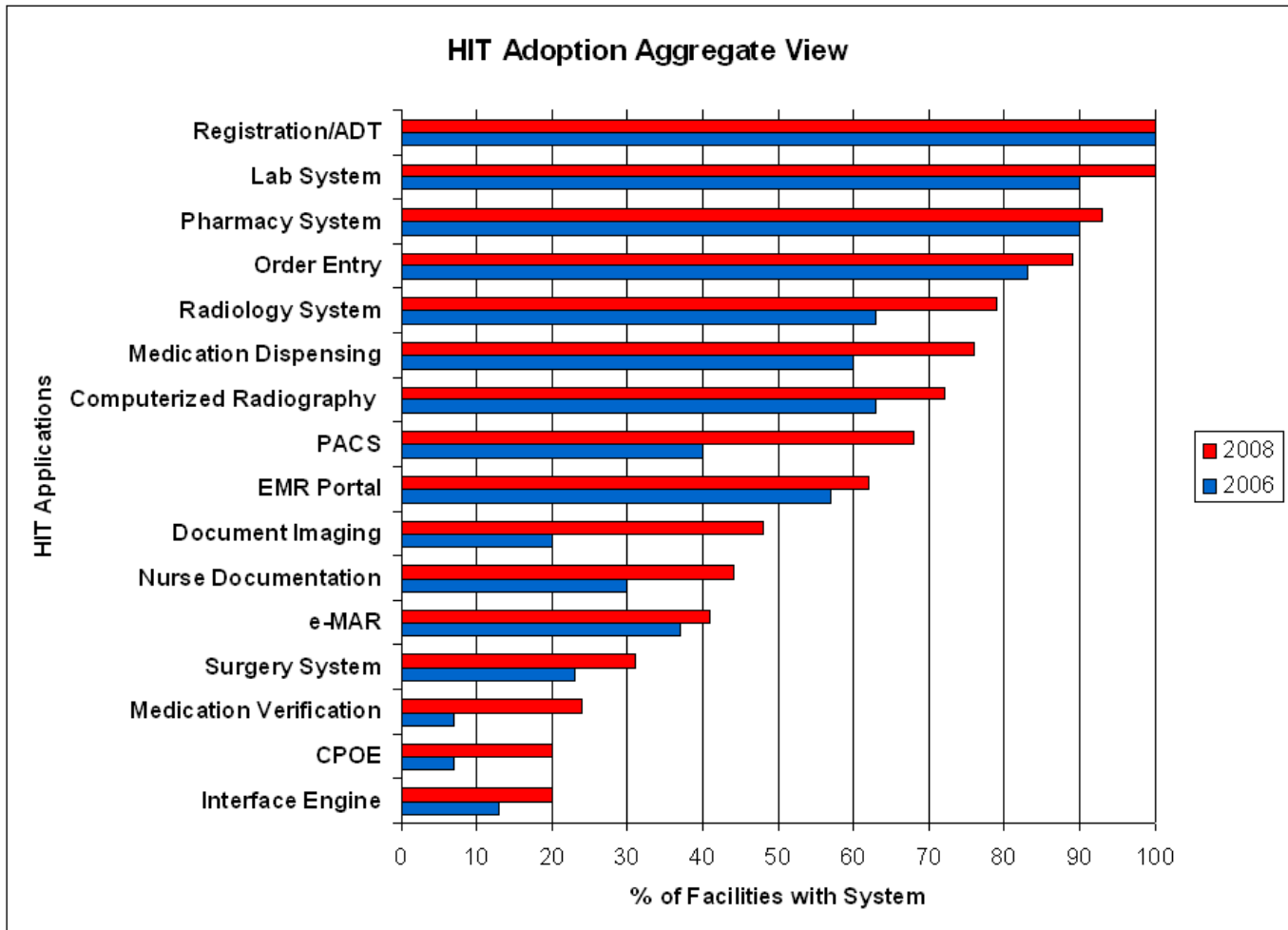
19. Long Term Care EMR System, and

20. Home Health EMR System

3. HIT Adoption Results

The results of the study are represented below in the form of bar graphs, along with commentary relating to each bar graph representation. The hospitals have been de-identified, in order to avoid competitive advantage issues.

Figure 1: Density of HIT Adoption in Wisconsin Rural Hospitals (Aggregate View)

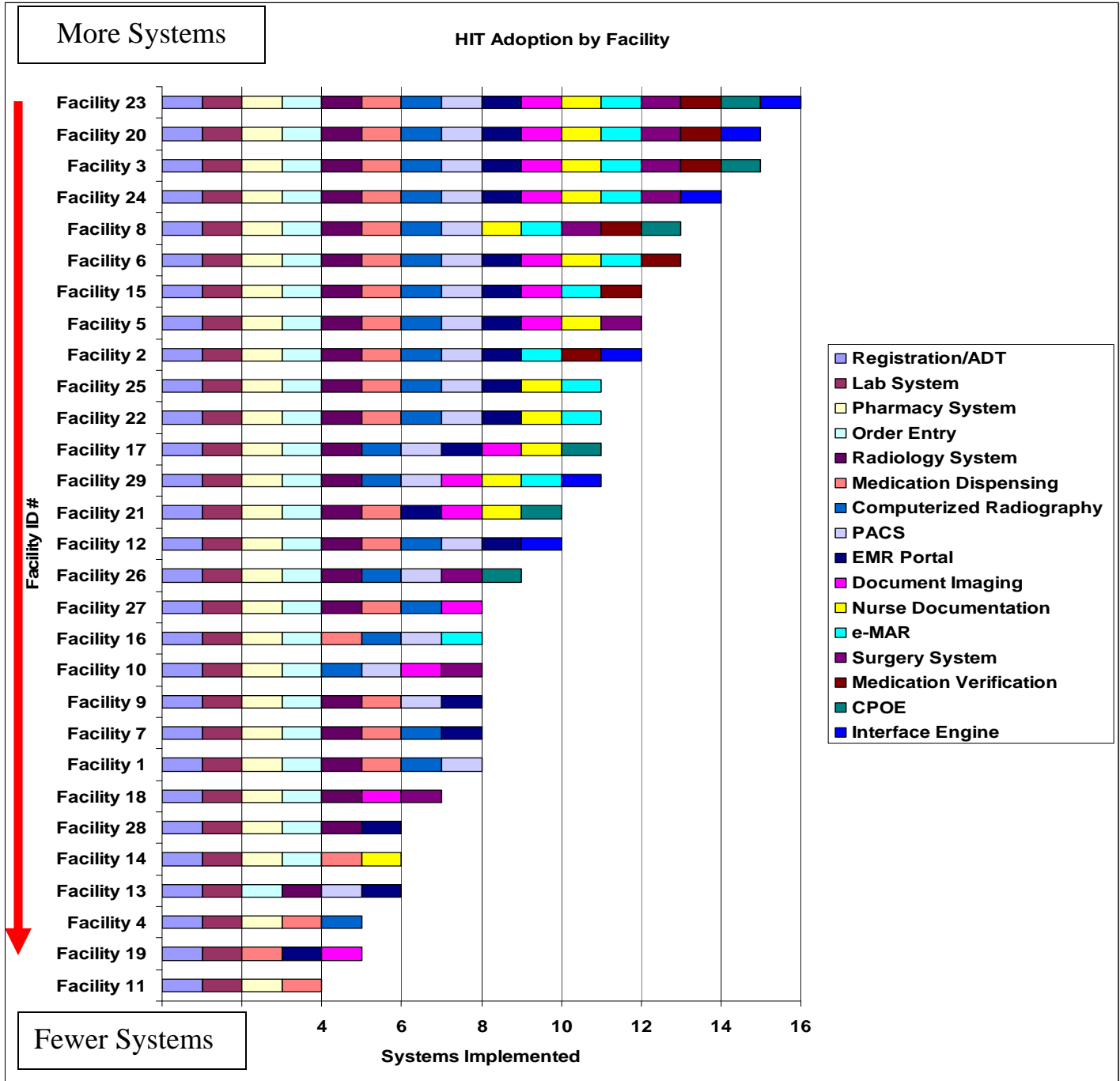


Commentary relating to Figure 1

Rates of adoption increased in all categories between 2006 and 2008, with overall adoption rates going from about 50% to 60%. PACS and Document Imaging saw the greatest gains. Two advanced patient safety systems—CPOE and medication administration verification—also saw significant gains, though adoption of these systems was still below 25% (these two clinical systems are capstone applications that require intensive change management, educational resources and high ongoing investment to operate: see commentary of charts 8, 13 & 14).

Get ready for another spike in adoption: not reflected in this data is that many hospitals reported plans for imminent implementations of Nurse Documentation systems (10 hospitals), e-MAR systems (11); and CPOE (6).

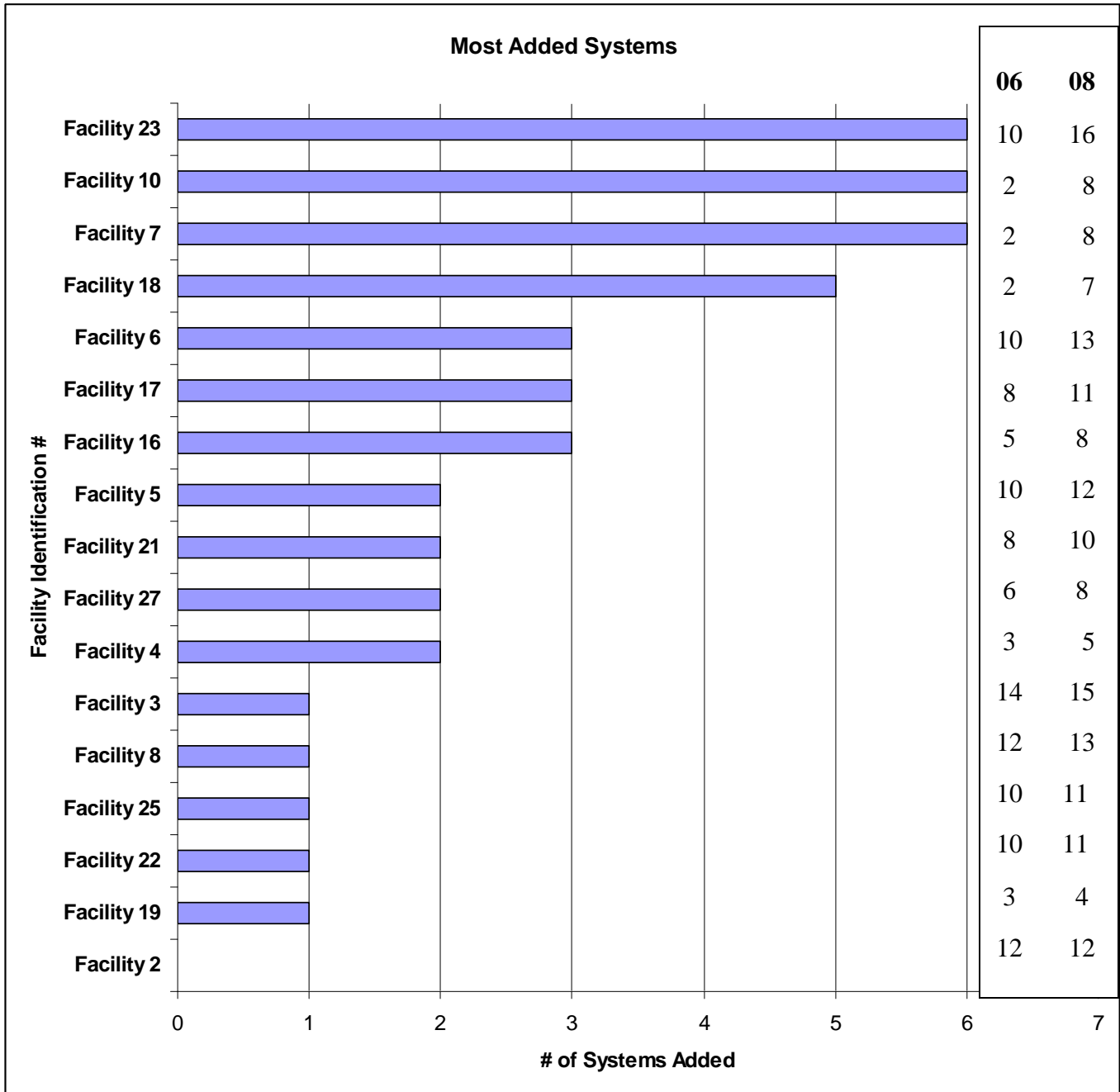
Figure 2: HIT Adoption by Facility



Commentary relating to Figure 2

This chart indicates that 75% of hospitals have at least half of the 16 indicators; in 2006 that number was 53%. In a recent study that used the same system definitions, the Wisconsin Hospital Association (WHA) reported that 40% of Wisconsin hospitals have a high rate of adoption (13 to 16 systems); 36% have a moderate rate (9-12 systems); 14% have a low rate (5-8 systems); and 10% are getting started (0-4 systems). The rural hospitals in this study have 18% high; 38% moderate; 39% low; and 7% getting started.

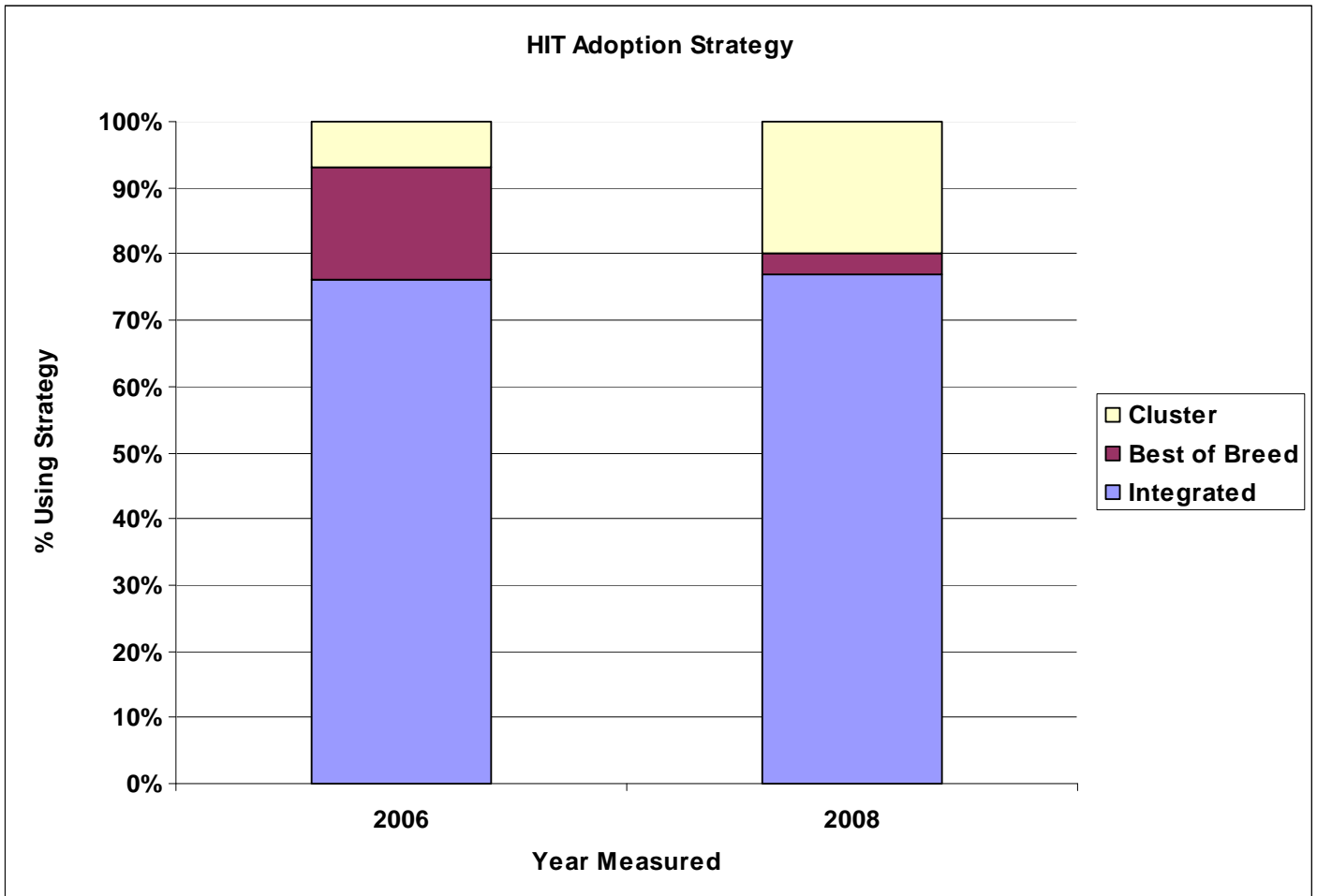
Figure 3: Most Added Systems



Commentary relating to Figure 3

This figure is a representation of the 17 participants that also submitted data in 2006. 3 hospitals added 6 systems during that period, and 1 hospital added 5. This does not reflect systems that existed but were replaced. Factors contributing to these increases included 16 systems added by 4 hospitals participating in a collaborative HIT project partially funded by HRSA (CAHHITN) and the FCC (Rural Healthcare Pilot Program); and 6 systems implemented by a hospital in partnership with a large tertiary center.

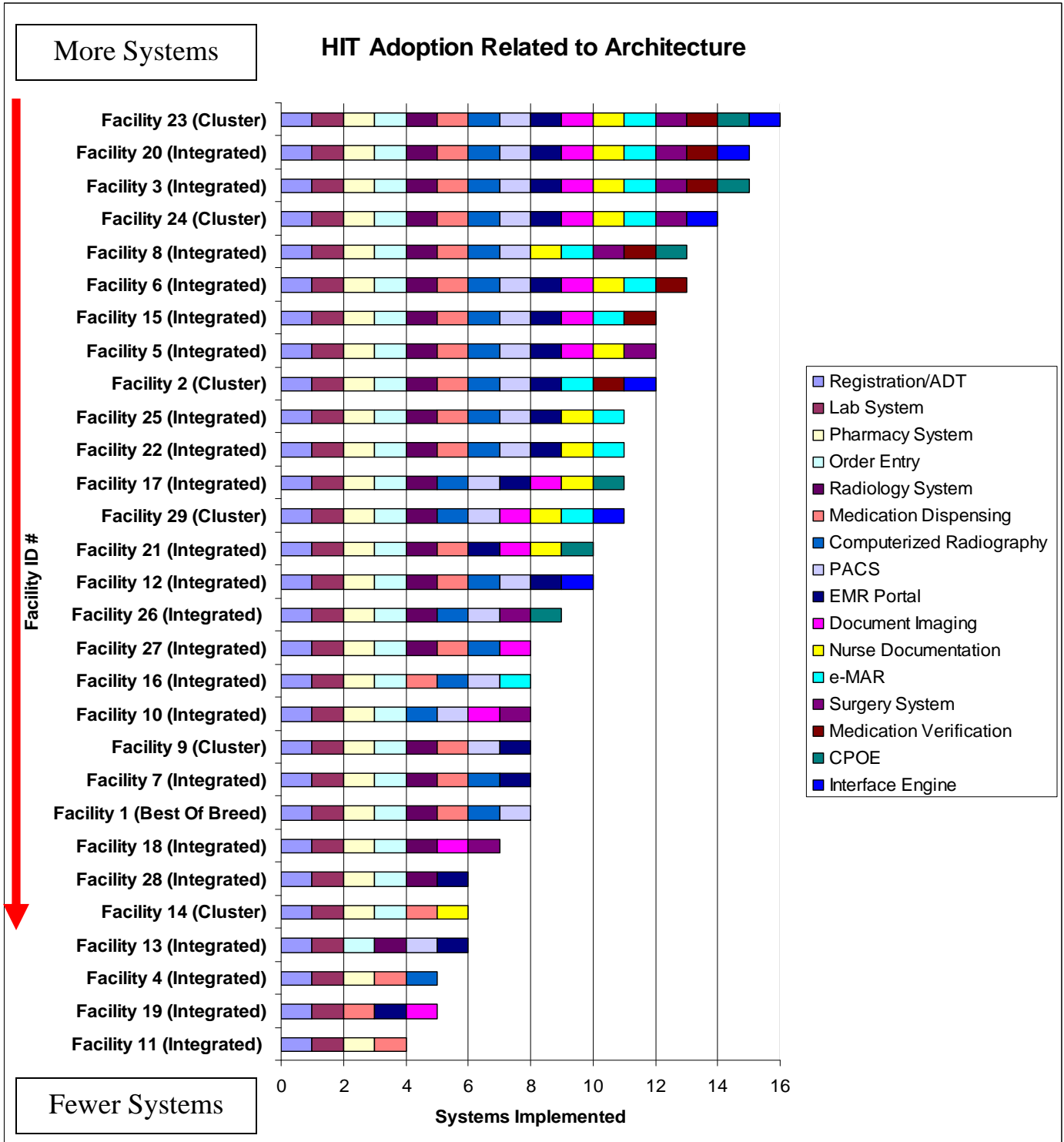
Figure 4: Hospital Information System (HIS) Architecture



Commentary relating to Figure 4

This slide breaks out hospital system implementation strategies by HIT architecture. **Integrated** is defined as the strategy of using primarily one vendor for HIT needs. **Cluster** is defined as the strategy of using a limited cluster of vendors for HIT needs, as when one vendor is used for clinical functions and another for financial and facility management functions. **Best of breed** is defined as the strategy of using many disparate vendors in a variety of departments. As in 2006, nearly 80% of rural hospitals use an integrated HIT strategy; there was an uptick in respondents reporting using cluster strategies; best of breed use receded to 1 facility.

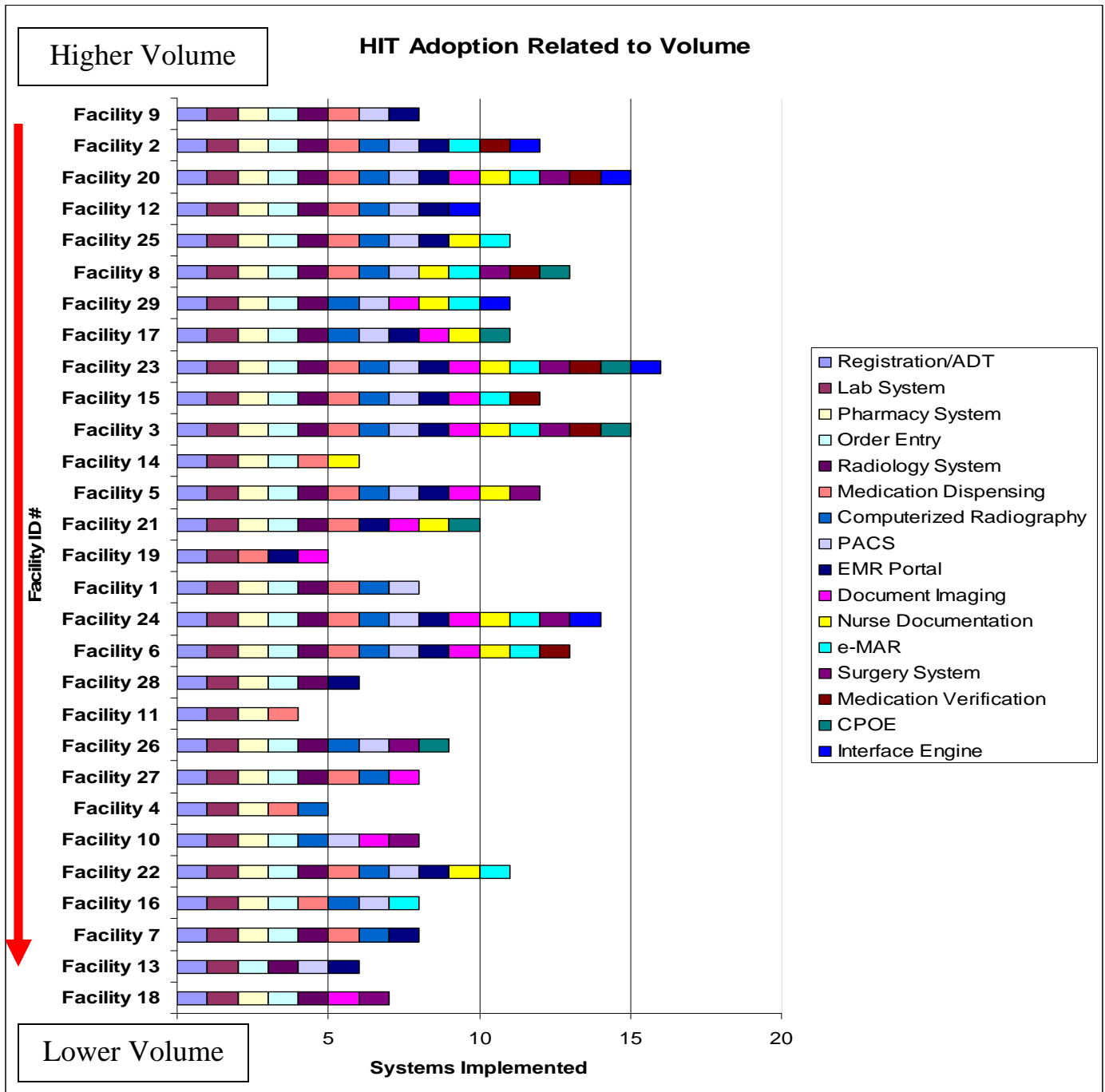
Figure 5: HIT Density Related to Architecture



Commentary relating to figure 5

Integrated and Cluster strategy hospitals can be found throughout the adoption spectrum. Not captured in this slide: the smallest 10 hospitals all use integrated strategies.

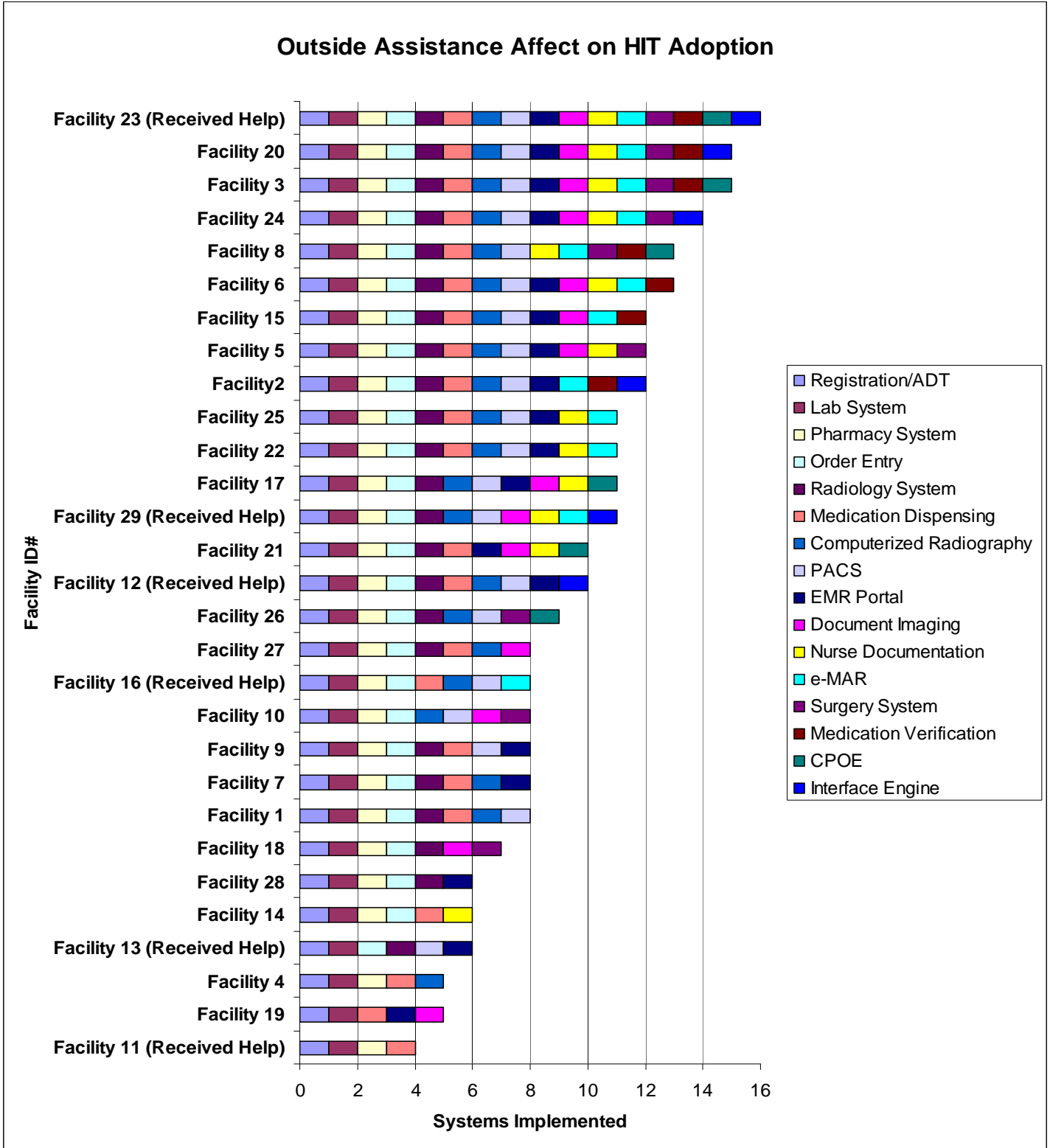
Figure 6: HIT Density Related to Volume (represented by Net Patient Revenue)



Commentary relating to figure 6

One would expect a higher adoption of HIT in higher volume hospitals, as higher volume hospitals may have more capital and FTEs to purchase and support the systems, and higher volume may correlate with greater HIT financial ROI. The smallest volume facilities (1/3rd of the total) averaged 7.4 systems implemented, compared to an overall rural average of nearly 9.6 (23% variation). The variation would be even higher (33%) when excluding the impact of the collaborative HIT project mentioned in the commentary of Figure 3.

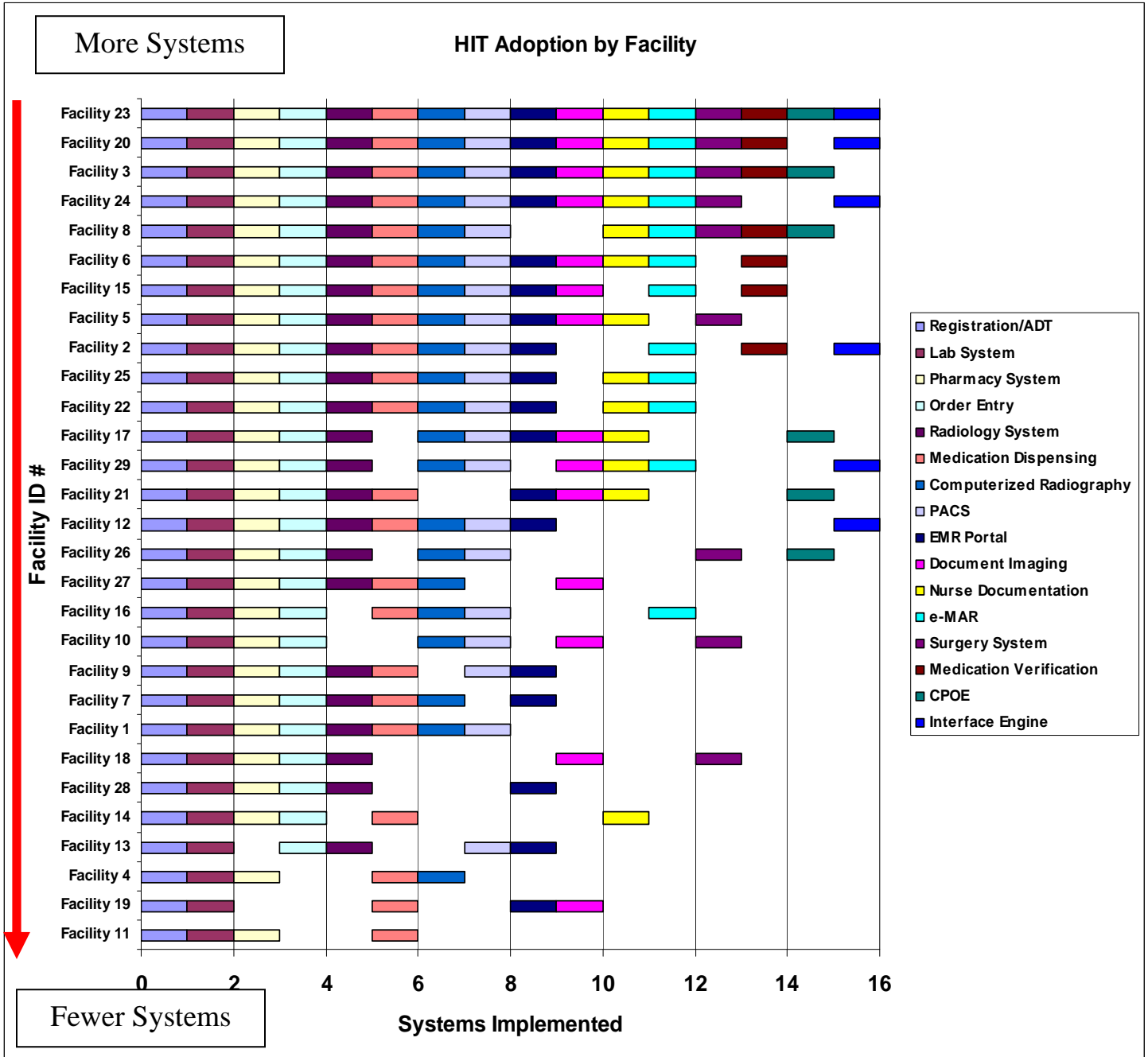
Figure 7: HIT Density Related to Outside Assistance (as from larger hospitals)



Commentary relating to figure 7

HIT adoption is clearly not dependent on outside assistance from larger hospitals, as 11 of the 12 top adopters did not receive outside assistance.

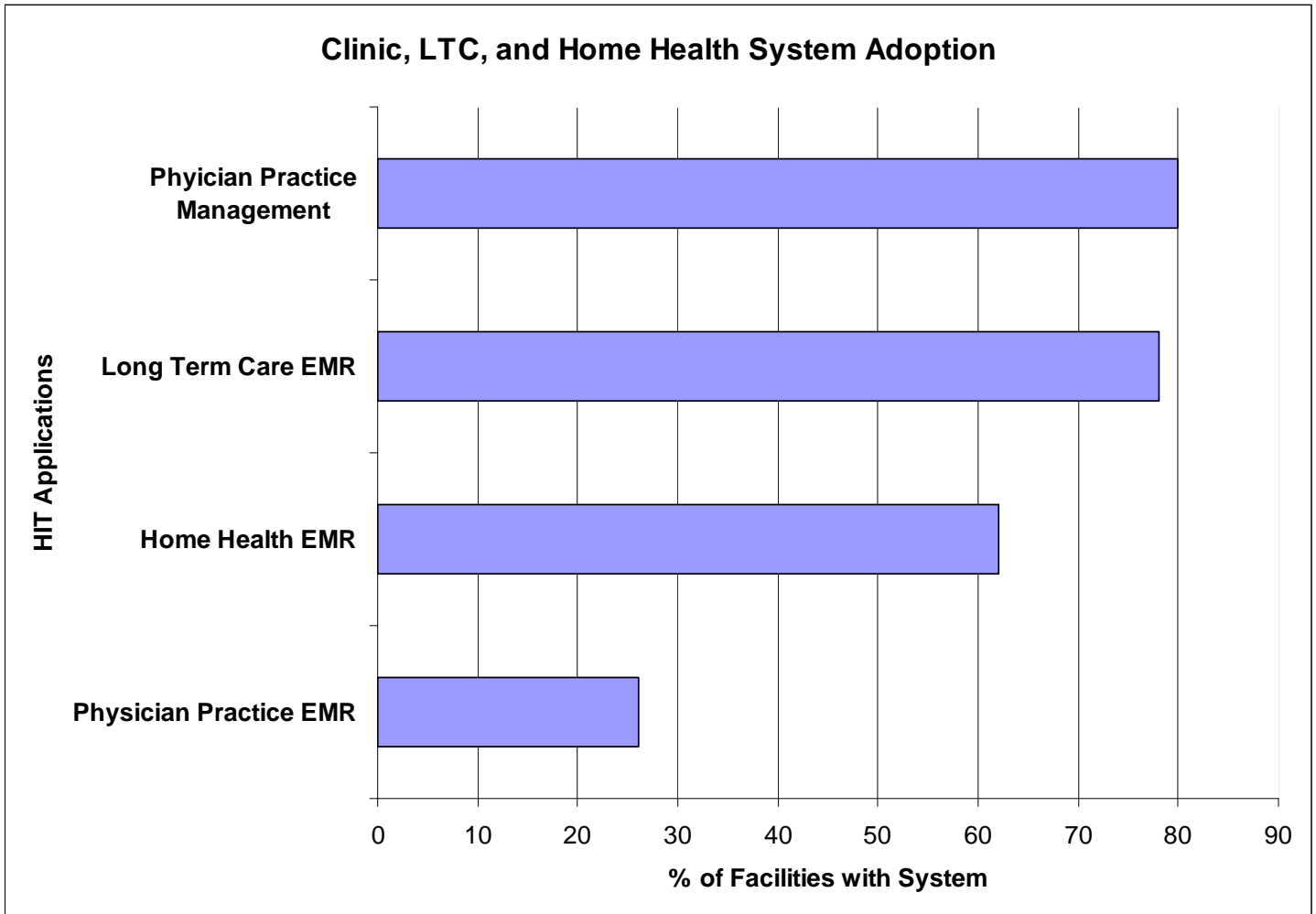
Figure 8: Density of HIT Adoption



Commentary relating to figure 8

This slide visually demonstrates the density of specific applications being used in rural Wisconsin hospitals. While hospitals on the lower spectrum of adoption may have document imaging and surgery management systems in place, they generally do not jump right to advanced clinical systems (nurse documentation, CPOE, e-MAR, and medication verification). Hospitals implement advanced patient safety systems as capstone applications on top of significant preliminary HIT application work.

Figure 9: Hospitals that Operate Clinics, LTC Centers, and Home Health with EMRs



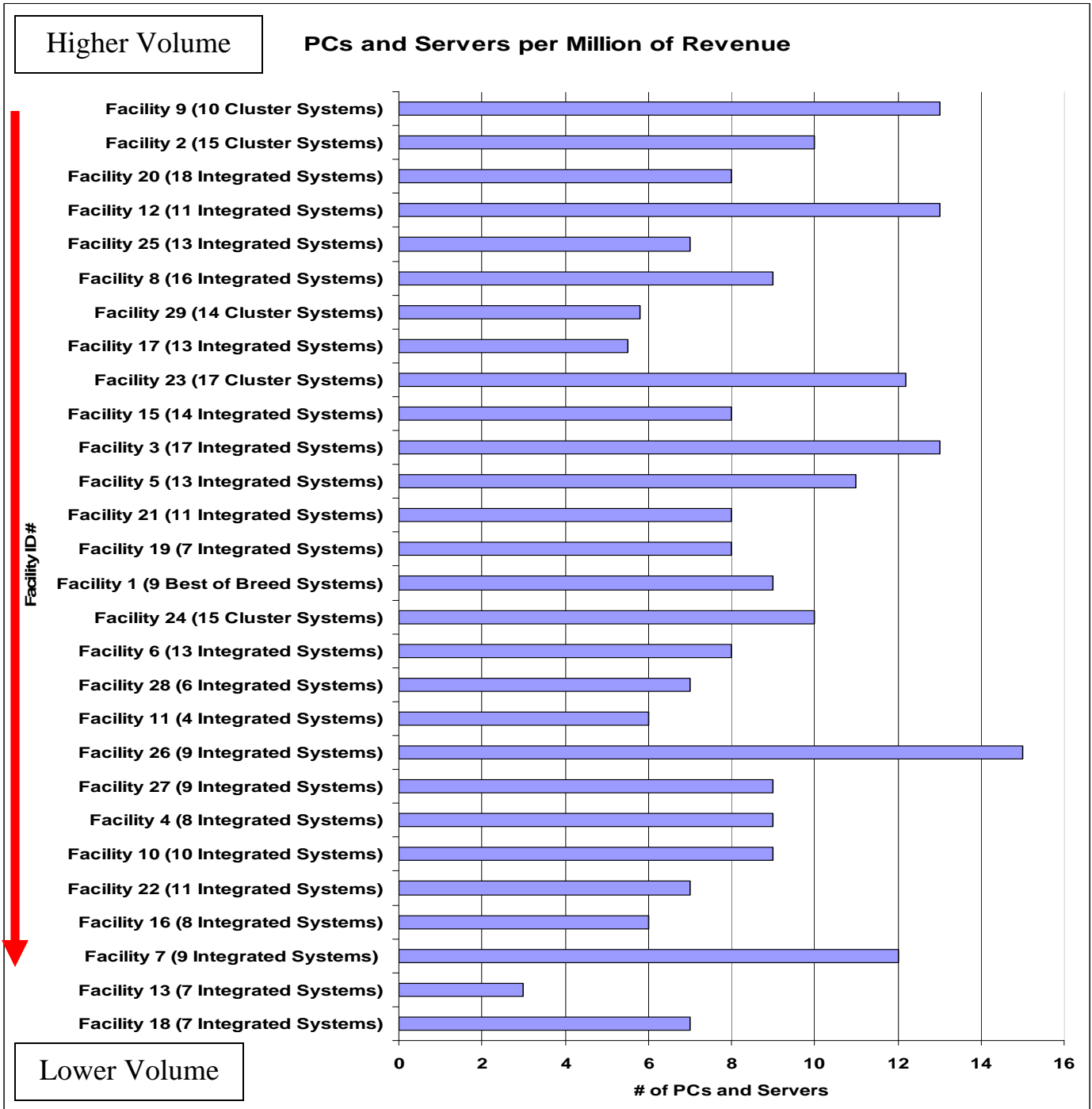
Commentary relating to figure 9

8 hospital respondents indicated they operated home health departments; 15 operated long term care centers, and 20 operated physician clinics. As is consistent with national averages, physician practice EMRs had the lowest implementation rates, at about 25%.

We will be adding these applications to the facility totals as we move on to look at staffing and spending levels.

4. HIT Staffing and Spending Results

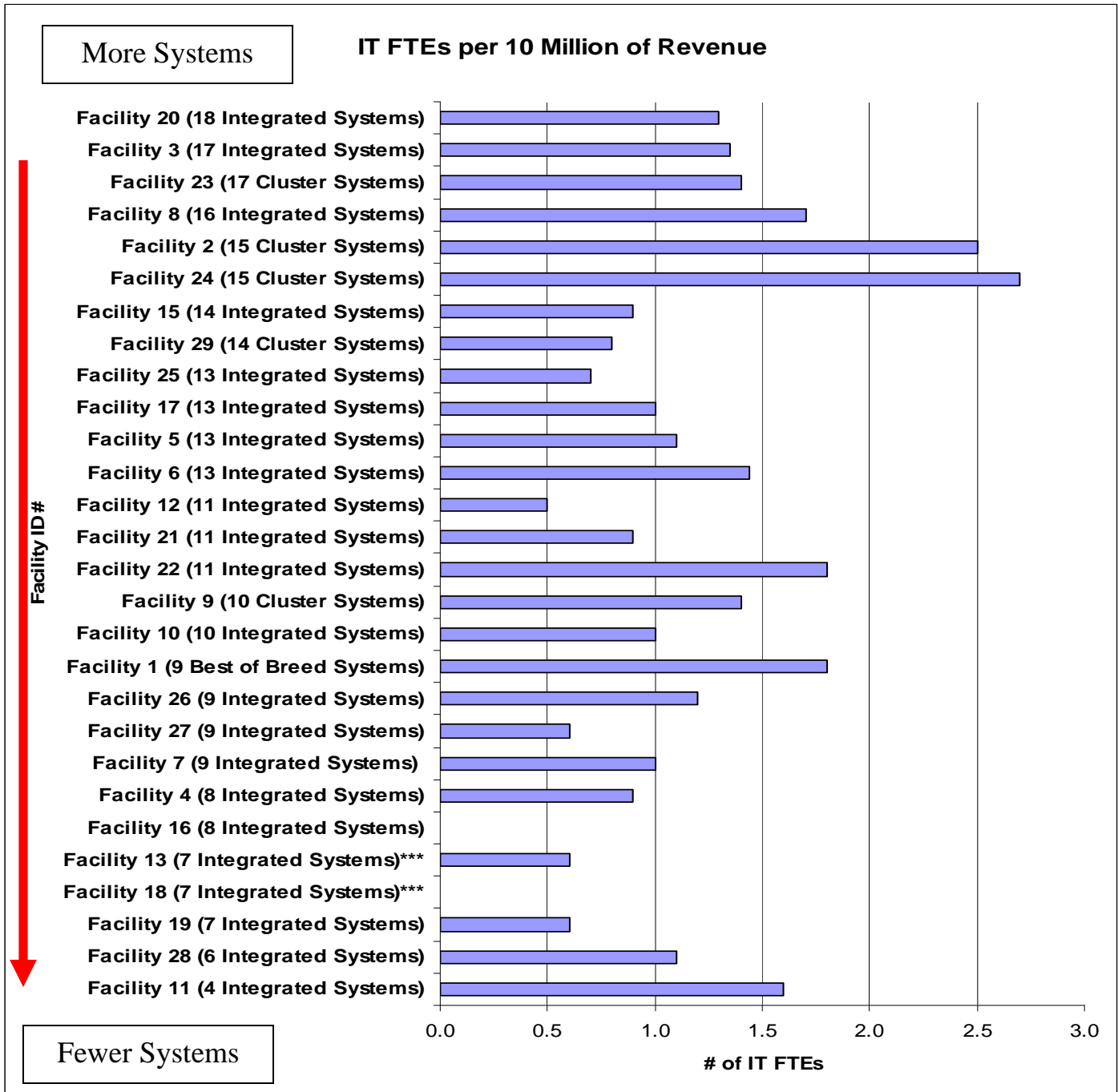
Figure 10: PCs and Servers per Million of Revenue



Commentary relating to figure 10

The average number of PCs and Servers per million in hospital revenue was 9.2. For cluster and best of breed strategies, the average was about 12. There didn't seem to be significant correlations between # of systems implemented or facility volume and PC/Server #s.

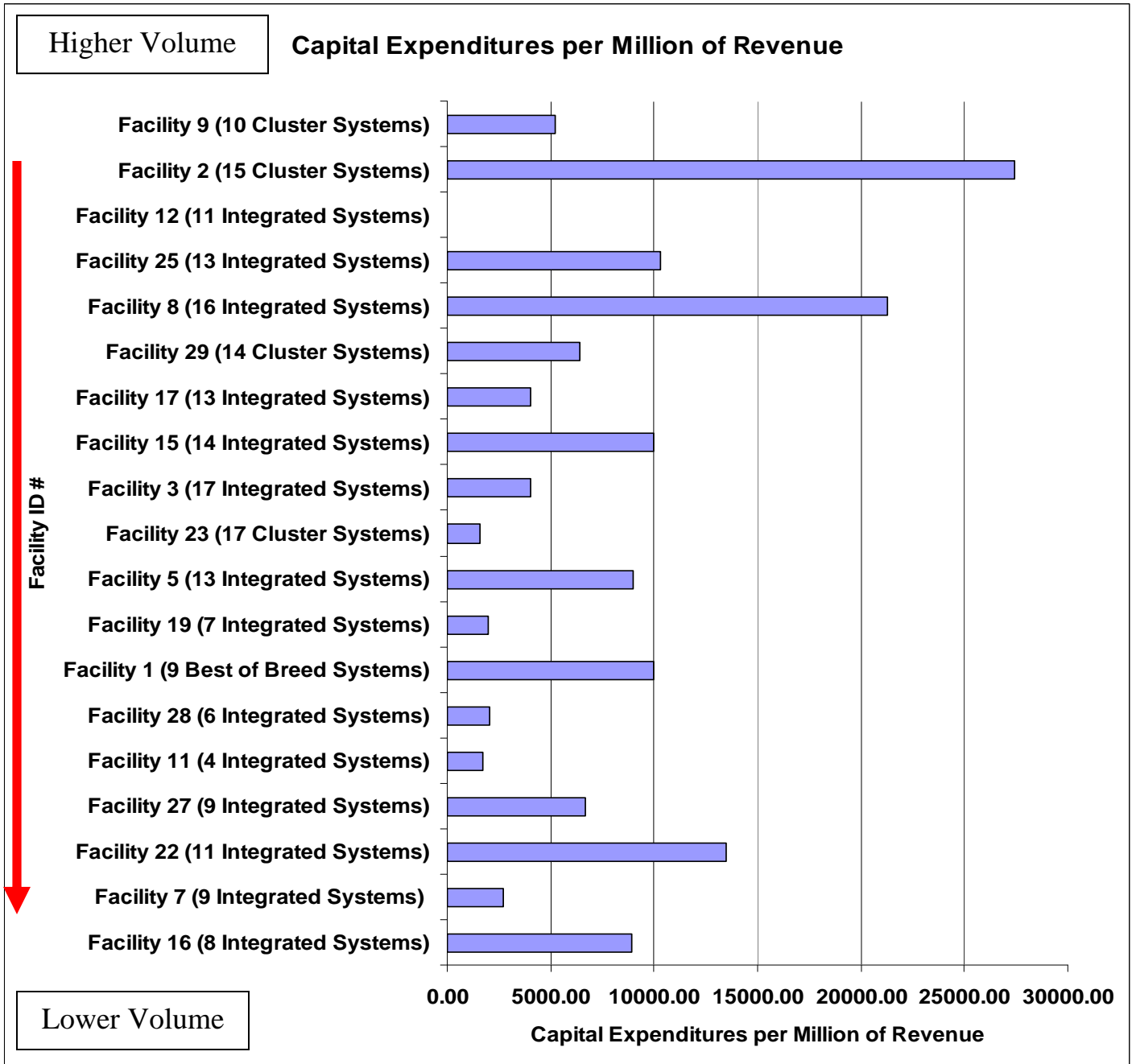
Figure 11: FTEs per 10 Million of Revenue (PACS not Included)



Commentary relating to figure 11

This is a somewhat tricky area, as respondents don't always include FTEs that serve HIT education and support roles, as well as outsourced FTEs (we have added asterisks where we know numbers are underreported due to outsourcing). Overall, average reported FTEs per 10 million in revenue was 1.21. But system adoption is a key factor here. Facilities with 12 or more systems averaged 1.47 FTEs, and facilities with 15 or more systems averaged close to 2 FTEs. Facilities with cluster and best of breed strategies employed the most FTEs on average.

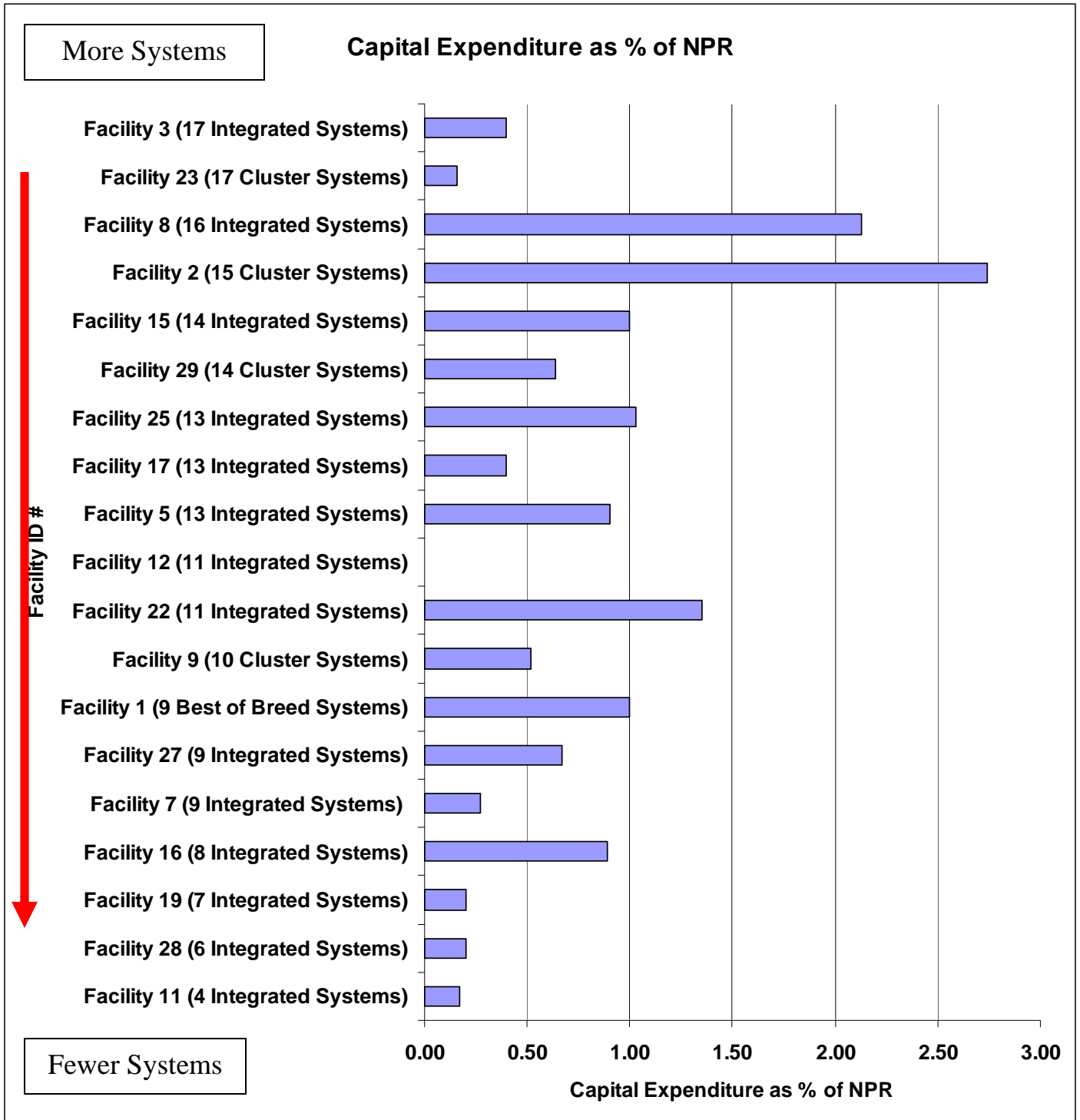
Figure 12: Capital Expenditures per Million of Revenue (PACS not Included)



Commentary relating to figure 12

Overall, average capital expenditure per million of revenue was \$8,000. For those hospitals with 12 or more applications, the average was \$11,000. AHA and WHA average expenditure in this category is \$5500 per bed. Because so many of the hospitals in our study are 25 bed CAHs, we looked at this from the revenue (volume) side rather than bed-size to better differentiate participants.

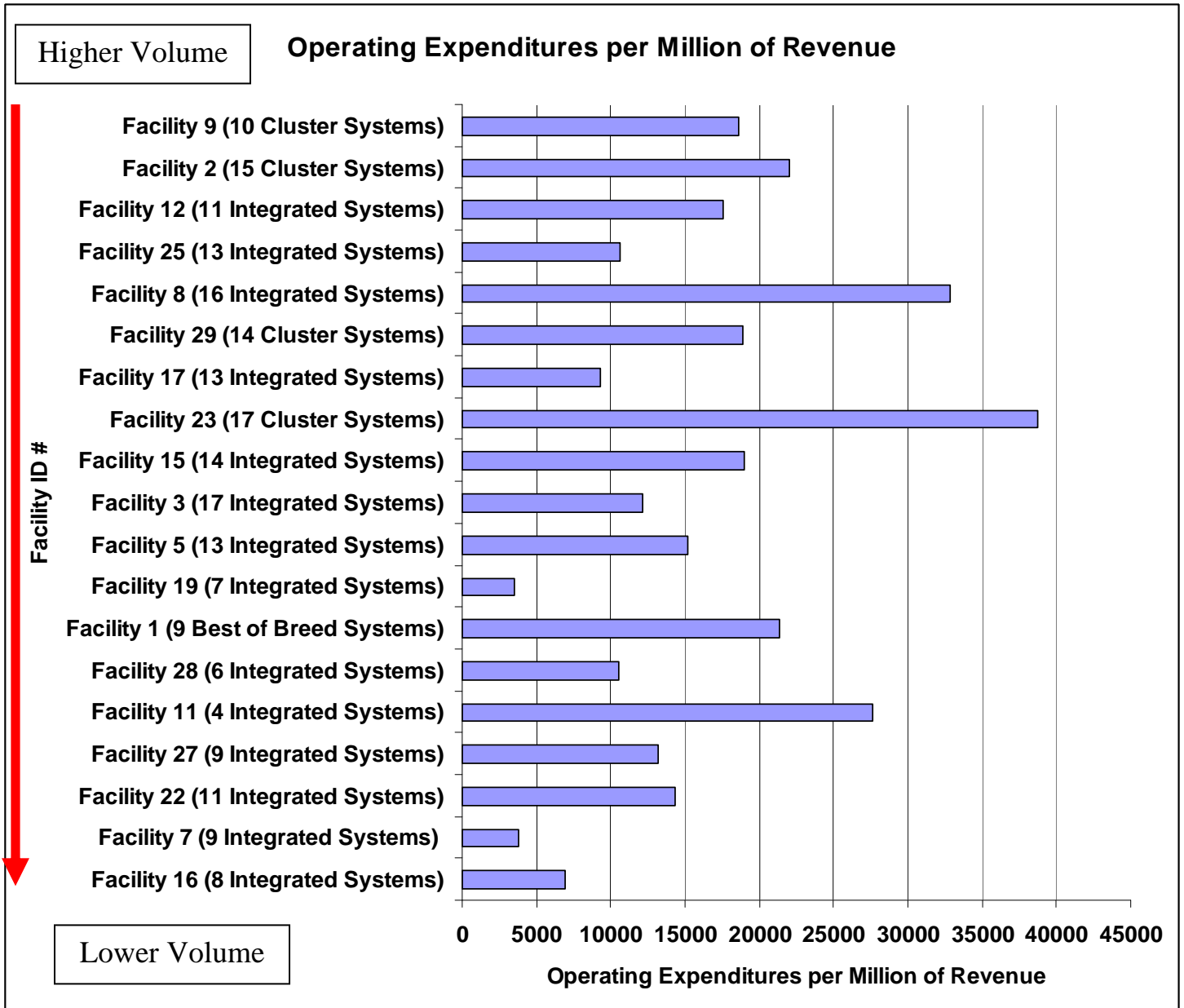
Figure 13: Capital Expenditures as % of NPR (PACS not Included)



Commentary relating to figure 13

Overall, average capital expenditure as percentage of NPR was .80%. For those hospitals with 12 or more applications, the average was 1.1%

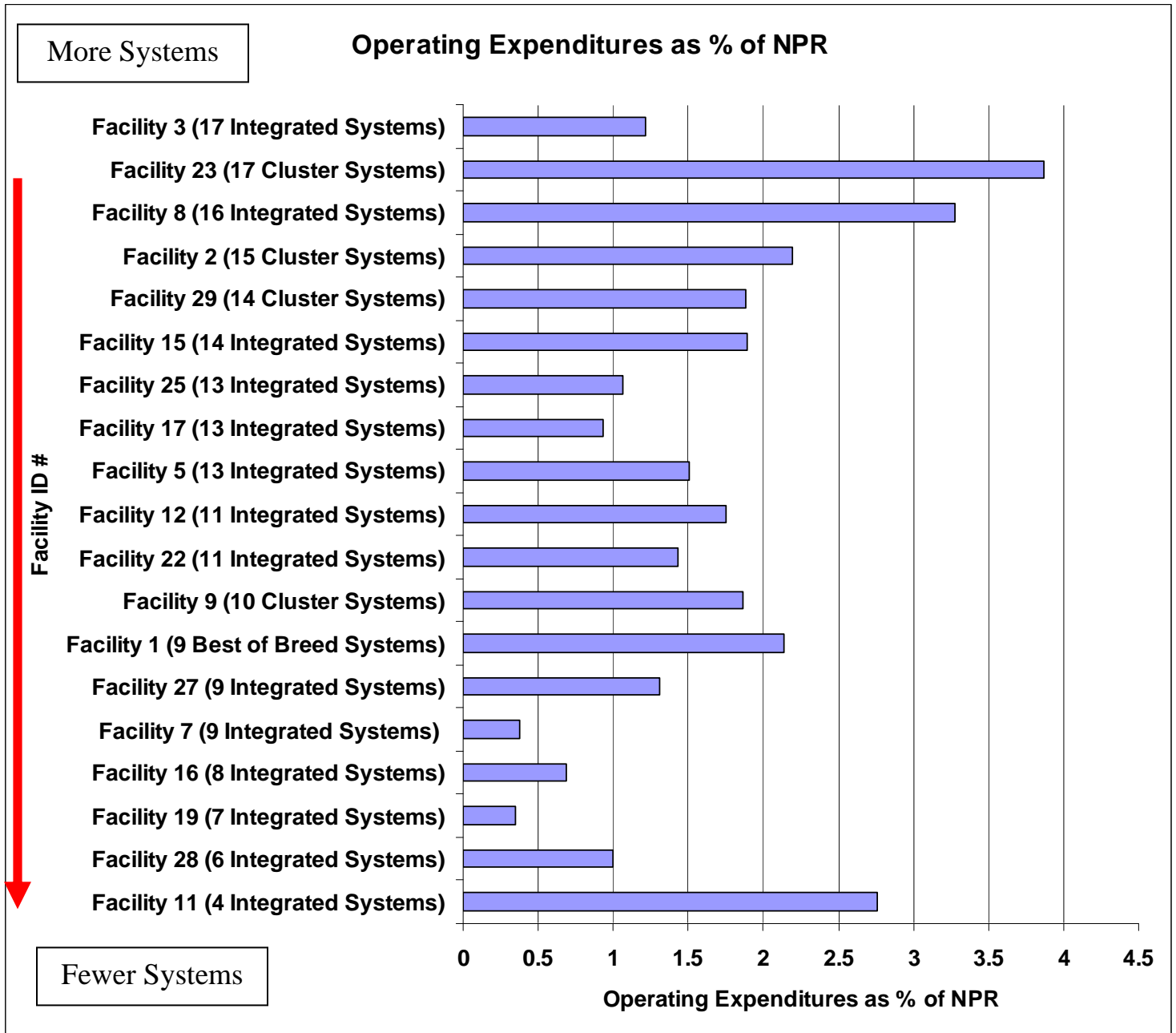
Figure 14: Operating Expenditures per Million of Revenue (PACS not Included)



Commentary relating to figure 14

Overall, average operating expenditure per million of revenue was \$17,789. For those hospitals with 12 or more applications implemented, the average was \$21,589. For those with 15 or more apps, the average was over \$30,000. WHA/AHA average expenditure in this category is \$12,000 per bed.

Figure 15: Operating Expenditures as % of NPR (PACS not Included)



Commentary relating to figure 15

Overall, average operating expenditure as percentage of NPR was 1.8%. For those hospitals with 12 or more applications, the average was 2.2%. For those with 15 or more applications, the average was 3.0%.

5. Conclusions

- 1. HIT adoption in rural Wisconsin hospitals is increasing at a steady pace, with adoption rates of identified systems going from 50% in 2006 to 60% in 2008. Also, many study participants noted plans for 2008-2009 implementations.**
- 2. Even with these gains, only 18% of these rural hospitals had high rates of adoption (high is defined as 13-16 systems) compared to 40% of all Wisconsin hospitals (per 2008 WHA data on all Wisconsin hospitals).**
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- 6. As we would expect, the more systems that were implemented, the more staff was employed to support them. Facilities with 12 or more systems employed 20% more FTEs than the average, and facilities with 15 or more systems employed 70% more FTEs than the average.**
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6. Policy Recommendations

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