

# Using Cost per Unit Modeling to Drive Improved Performance in a Multiple Hospital System

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# Purpose

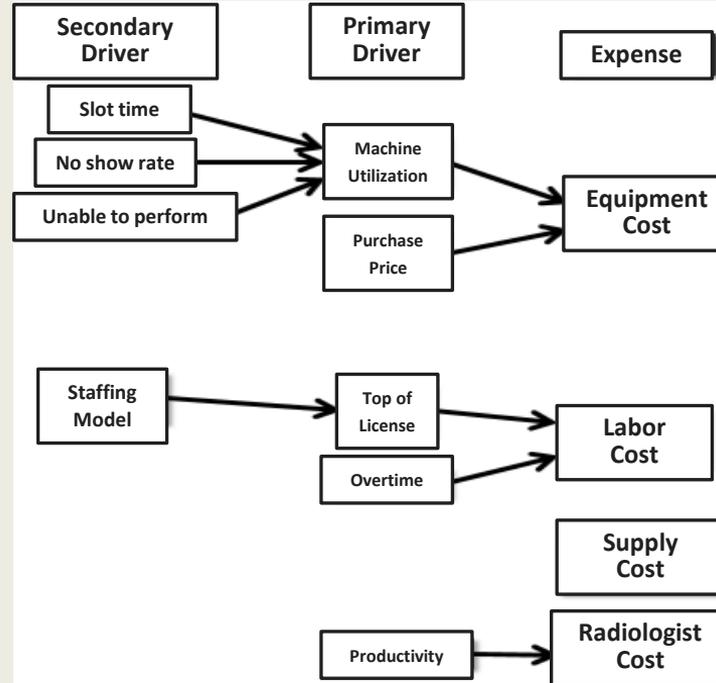
- Reduce the cost to deliver a unit of service in radiology departments
- Use cost-per-unit expense modelling to identify and prioritize cost saving opportunities in an academic, multi-site CT, MRI and US service.

# Materials and Methods

- Expense under the direct control of radiology departments were broken down into four major categories which included
  - Professional services (radiologists)
  - Technical staff (technologists, aides and flow staff)
  - Equipment costs (depreciation/lease and maintenance)
  - Supply/pharmaceutical costs (contrast, linen)
- We developed a model that evaluated the cost drivers for each expense category to evaluate opportunities and the impact of changes to the inputs.

# Materials and Methods

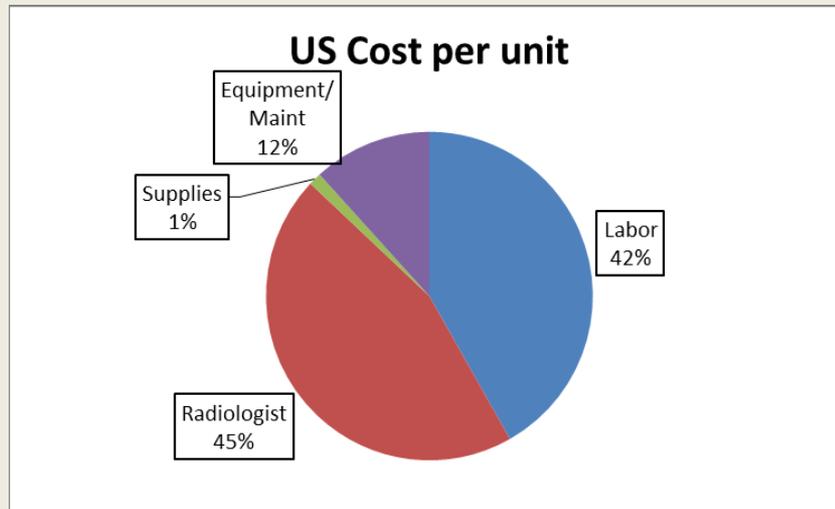
- Primary and Secondary expense drivers and their relationship to each other were plotted on a flow chart.
- The magnitude of contribution of expenses in the 4 major cost categories was calculated



# Results

## Ultrasound Cost Per Unit

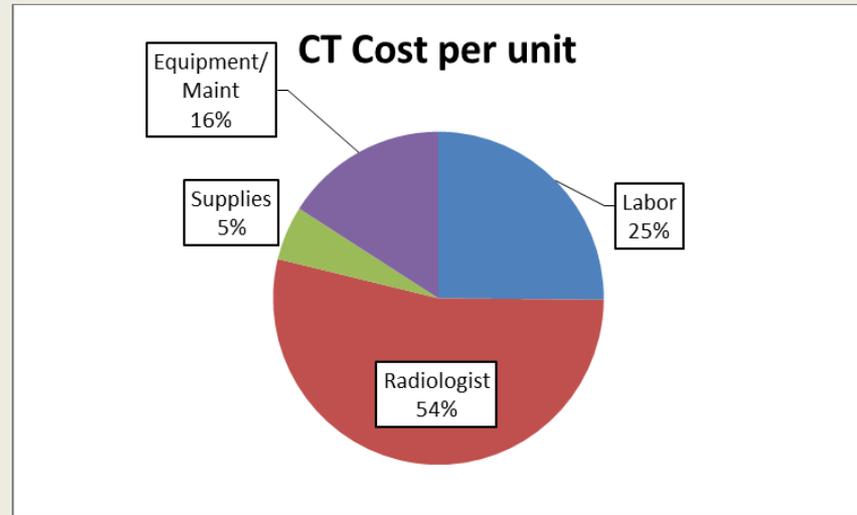
- Labor is 87% of the expense to deliver an US, split nearly evenly between the technical and radiologist labor components.
- Equipment and maintenance have relatively small contributions to the overall cost per unit.



# Results

## CT Cost Per Unit

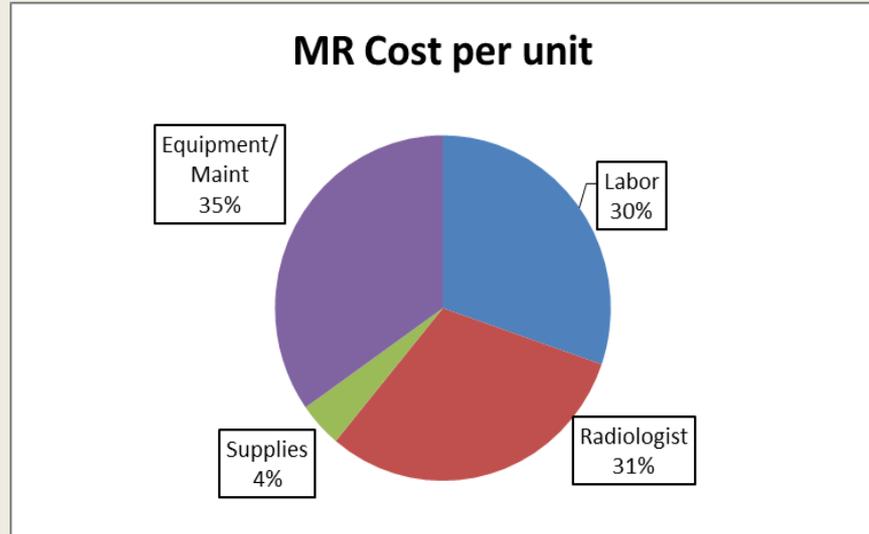
- The largest percentage of expense is the radiologist cost followed by technical labor, which together are 79% of the cost of a CT.
- Equipment and maintenance expense are the bulk of the remaining cost in CT.



# Results

## MRI Cost Per Unit

- There is significantly larger proportion of expense from equipment and maintenance (35%), over twice the percentage from CT and 3 times US.
- There is equal contributions from labor and radiologist expense at about 30% each.

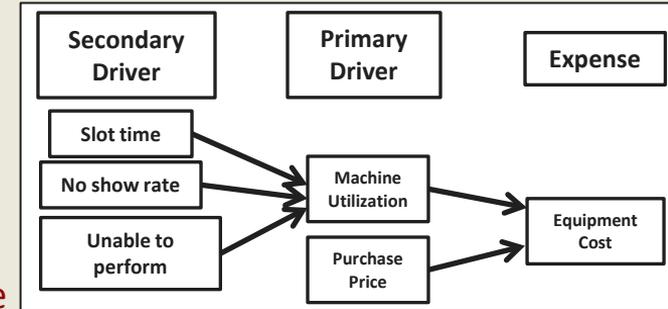


# Discussion

- The unique expense profile of each modality dictates different approaches to cost per unit reduction strategies in each modality with attention to the relative contributions of the expense drivers that are within the department's control.

# Practical Example-Equipment

- Primary drivers of equipment expense are purchase price and machine utilization
- A 10% reduction in equipment and maintenance purchase price (which may be a negotiated discount) has a differential impact on cost per unit in the various modalities.
  - Ultrasound: Reduction in cost per unit of 1.2%.
  - CT: Reduction in cost per unit of 1.6%.
  - MRI: Reduction in cost per unit of 3.5% .
- Significantly greater impact can be achieved through evaluating the most appropriate technology level of equipment to serve patients
  - \$1.4M 128-slice CT vs. refurbished 128-slice CT for \$700k (50% reduction)
  - \$2.1M 3T MR system vs. \$1.4M 1.5T (33% lower cost)
- Equipment selection is a critical part of optimizing cost to deliver a service, particularly for MRI
- Optimizing machine utilization is a second important factor, which can be done through reviewing time allotted for each exam, and reasons for empty slots on the schedule (no show, incorrect order or pre-certification, labs)

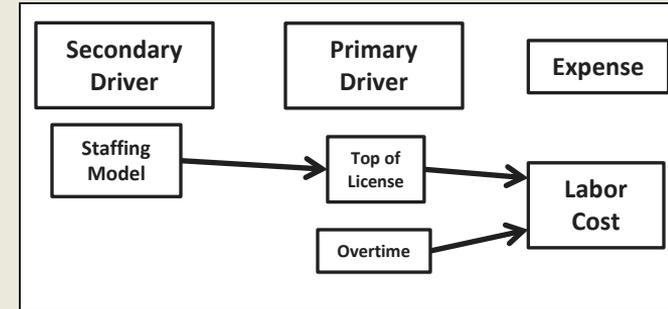


# Practical Example-Radiologist

- Primary driver of expense
  - Productivity
- A 20% increase in radiologist productivity affects cost per unit in various modalities differentially.
  - Ultrasound: Reduction in cost per unit of 9%.
  - CT: Reduction in cost per unit of 11%.
  - MRI: Reduction in cost per unit of 6 %.
- Optimizing workflow and tools to maximize CT an US reading efficiency has the greatest impact to cost per unit.

# Practical Example-Labor

- Drivers of technical labor expense are the staffing model (how many technologists vs. tech aids, shift length) and overtime utilization
- Shift standardization that results in technologist labor reduction by 20% affects cost per unit in various modalities as follows:
  - Ultrasound: Reduction in cost per unit of 8.4%
  - CT: Reduction in cost per unit of 5%
  - MRI: Reduction in cost per unit of 6%
- A 20% reduction in technical labor costs has a significantly larger effect on Ultrasound delivery than the other modalities.



# Conclusions

- Using this model, a radiology department can estimate the impact of changes and decisions on cost to deliver a test. Focusing efforts on the major cost drivers in a given modality allows appropriate application of resources toward cost per unit improvement efforts.