Reducing
Chronic Heart Failure Readmissions
Through
Quality Management

By

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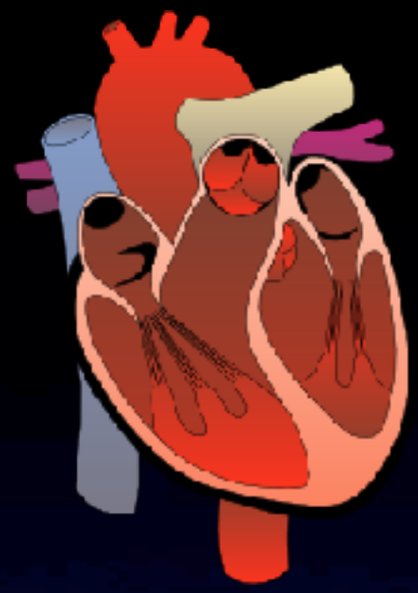
Chronic Heart Failure

- Chronic Heart Failure [CHF] is the 4th most common reason for hospital admissions, accounting for approximately one million annual cases (DHHS, 2010).
- CHF Patients have reduced quality of life and increased morbidity and mortality.
- CHF is associated with a slow decline in health status, with repeated hospitalizations, which ends in forced dependency.

  (Bosworth, Steinhauser, Orr, Lindquist, Grambow, & Oddone, 2004)
- 24.5% national rate of readmission, within 30 days of discharge, for Medicare and Medicaid clients with CHF. (DHHS, 2010)
- CHF Readmission rates are difficult to reduce

Literature Review



- Poor Client Adherence (Harkness, 2002)
  - Recommended Lifestyle Changes:
    - healthy, low salt diet & exercise
    - smoking, drug, & alcohol cessation
  - Medication Regimen:
    - Poor medication reconciliation & polypharmacy
    - Inability to pay for medications
- Depression, Anxiety & Fear (Bosworth, et al., 2004; Song, Lennie, & Moser, 2009)
- Low Healthcare Literacy (Hallerbach, et al., 2008)
  - Poor recognition of adverse signs and symptoms

Disease Management Programs

- Nurse-led Disease Management Programs [DMP] have:
  - Reduced length of stay [LOS] for CHF readmissions.
    (Thomas, 2007)
  - Improved clients' quality of life [QOL].
    (Williams, 2003; Daly, Genet-Kelley, Douglas, O'Toole, & Montenegro, 2007)

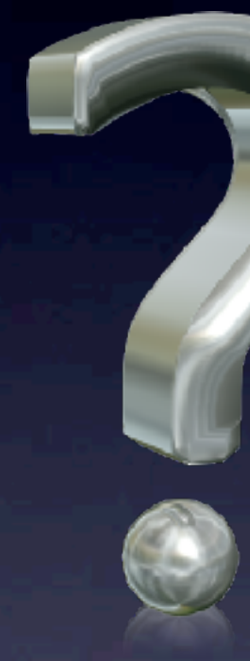
- DMPs have not been shown to reduce CHF readmissions
  - Including those with Visiting Nurses Services [VNS]
    (McCoy, Davidhizar, & Gillum, 2007)

- Nurse Practitioner-led DMPs have led to improved outcomes. (Griffiths, 2004; Naylor, Brooten, & Campbell, 2004)

- Screening clients for readmission risk could improve the cost-effectiveness of DMPs, by limiting enrollment.

Quality Improvement Question

- What are the identifying characteristics of local clients who are readmitted for CHF exacerbation, and is it possible to predict which clients will be readmitted within 30 days of discharge?



QI Project Aims

- Global Aim: To reduce CHF readmissions and associated costs
- Specific Aims:
  - To assess the reliability of Diagnostic Related Group [DRG] codes for CHF diagnoses through a Measurement Systems Analysis [MSA].
  - To develop models that accurately predict which clients with CHF will be readmitted within 30 days of discharge, using Visual Six Sigma [VSS] data analysis techniques.
  - To identify the key characteristics of clients with a high probability of readmission for CHF exacerbation, in order to choose interventions that address their specific needs.

Setting & Payer Mix

- Community, Non-teaching Hospital
- 20-bed Coronary Care Unit, usually not filled to capacity
- Large proportion of Medicare, Medicaid, and Self-paying clients
  - A former barrier to funding QI projects that aimed to reduce readmissions- individual readmissions generated income for many hospitals.

    (Subramanian, 2010)
  - However, hospitals now incur penalties from CMS for high rates of readmission. (Bhalla, 2010)

Medical Coding

- The Center for Medicare and Medicaid Services [CMS] tracks hospital admissions by Diagnostic Related Group [DRG] codes, which are assigned for each admission. (DHHS, 2010)
- CMS pays for each admission, based on the specific DRG code assigned for that admission, and a *per diem* rate that is weighted according to the hospital's basic characteristics. (Green & Rowell, 2010)
- A misapplication of DRG codes occurred in 49% of CHF admissions, according to one study.
  (Hallerbach, Francoeur, Pomerantz, Oliner, Morris, Eiger, et al., 2008)
  - 2 board-certified cardiologists in a large, urban, teaching hospital

The Coding Process

- Non-medical coders assign an ICD-9 code for each of a client's diagnoses, based on the physicians' notes in a client's medical record.
- All of a client's ICD-9 codes are then entered into a grouping program, which assigns a DRG code for tracking and reimbursement purposes. (Green & Rowell, 2010)
- Errors may occur, either during the assignment of ICD-9 codes, or the grouping process.

Visual Six Sigma [VSS]

(Cox, Guadard, Ramsey, Stephens, & Wright, 2010)

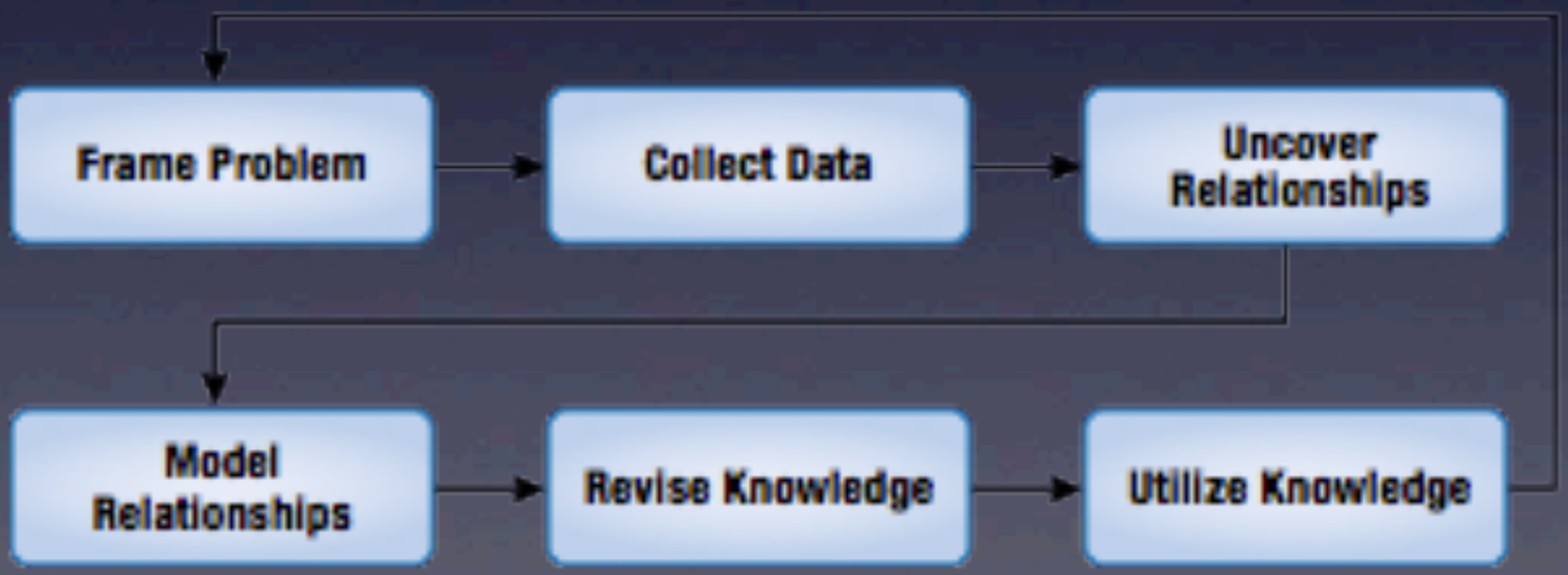
- Frame Problem
  - Key Process Indicators [KPI] & Outcomes
- Collect Data
  - Measurement Systems Analysis [MSA]
- Uncover Relationships
  - Exploratory Data Analysis [EDA]
- Model Relationships
  - Confirmational Data Analysis [CDA]
- Revise Knowledge
- Utilize Knowledge

Visual Six Sigma Road Map

(Ruddick, Liddle, & Moore, 2010)

www.jmp.com

Rapid Cycle Change



Reliability Assessment

- After defining key variables, operationally, the second step in a robust Quality Improvement project is to conduct a reliability assessment of tools that will be used for measuring the key variables, or key process indicators [KPI], and the outcomes.
- If an assessment tool has been validated, the reliability assessment for that tool has already been completed.
- It is equally important to define the participants well in operational terms, to ensure that changes in outcomes are relevant to the target population of clients.
- One should not rely on data, merely because it is easy to access, or abundant in quantity- DRG rates, for example.
- Such may be poor quality data and may not describe the process or participants very well. (Montgomery, Peck, & Vining, 2006)

Exploratory Data Analysis [EDA]

- Once the reliability assessment was completed, a comparative analysis of 45 independent variables was performed through dynamic visualization.
- Variables with the most significant interactions were used to develop predictive models, designed to screen clients with CHF DRG codes for the likelihood of readmission for all causes.
- Performing multiple types of data analysis may strengthen the collective plausibility of conclusions based on quantitative methods.
- Therefore, both Neural Net and Recursive Partitioning Models were developed to predict client readmissions.

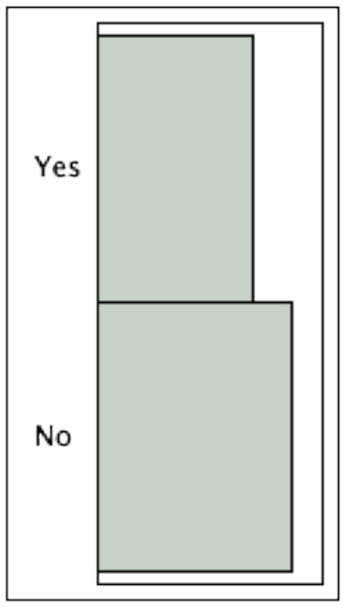
Reliability Results

- DRG codes for CHF include: 291, 292, and 293
- 44% (21; n=48) of clients assigned CHF DRG codes for reimbursement were not admitted for CHF exacerbation.
- Some clients had no CHF diagnosis, at all.
- 10% of clients (5; n=48) were not readmitted because they were discharged to hospice settings and refused future admissions to hospital settings.
- Because DRG codes are poor descriptors of the CHF population, the actual 44% (12; n=27) rate of readmissions due to CHF exacerbation is much higher than the reported 27% rate of clients readmitted within 30 days of discharge.

Clients Originally Admitted for CHF Exacerbation, Readmitted

Distributions

Readmitted < 30 days



Frequencies

Level	Count	Prob
No	15	0.55556
Yes	12	0.44444
Total	27	1.00000

N Missing 65

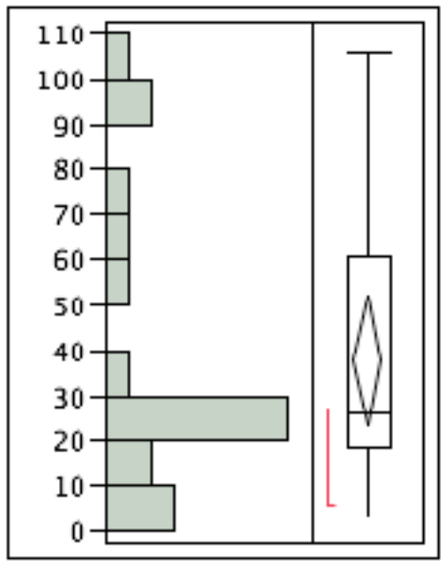
2 Levels

- Somewhere in the DRG coding process, the original, primary diagnosis was often lost.
- Such errors likely result from inherent flaws in the coding system, because rates at this hospital are consistent with those of other hospitals, which use the same coding system for CMS reimbursement.
- Microsystems exist within the macrosystem and suffer from its flaws.
- Clinical Nurse Leaders must learn to be discerning information managers, so they only use and disseminate accurate information.

Days to Readmission

Distributions

Days to Second Admission



Quantiles

100.0%	maximum	106
99.5%		106
97.5%		106
90.0%		90
75.0%	quartile	60.75
50.0%	median	26
25.0%	quartile	18.75
10.0%		6.1
2.5%		3
0.5%		3
0.0%	minimum	3

Moments

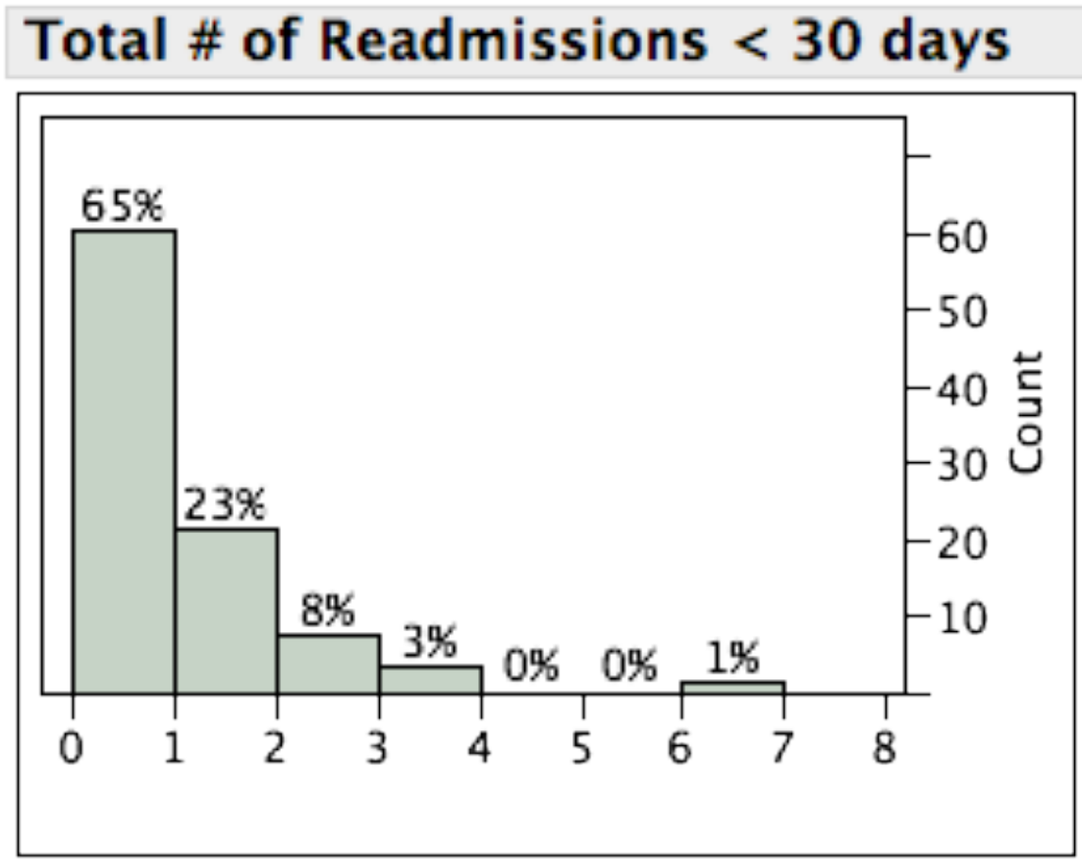
Mean	37.75
Std Dev	30.516389
Std Err Mean	6.823672
Upper 95% Mean	52.03211
Lower 95% Mean	23.46789
N	20

- Many clients were readmitted between 20 and 30 days, after discharge.
- Perhaps, just a little more help for those clients would have prevented readmissions within the 30-day benchmark.
- What services do those clients need to stay out of the hospital?

Exploratory Data Analysis Results

- The distribution of client readmissions for CHF seems to follow a Power-Law Curve. (Gladwell, 2006)
  - The majority of services are being used by a minority of clients, in terms of the number of readmissions.
- Among clients admitted for CHF exacerbation, the characteristics most predictive of readmission were: Renal Disease, COPD, and CAD comorbidities.
- Clients who were discharged home, with or without visiting nurses service, were readmitted within 30 days of discharge at high rates.
- Those discharged to skilled nursing facilities were seldom readmitted within 30 days of discharge.

Readmissions per Client



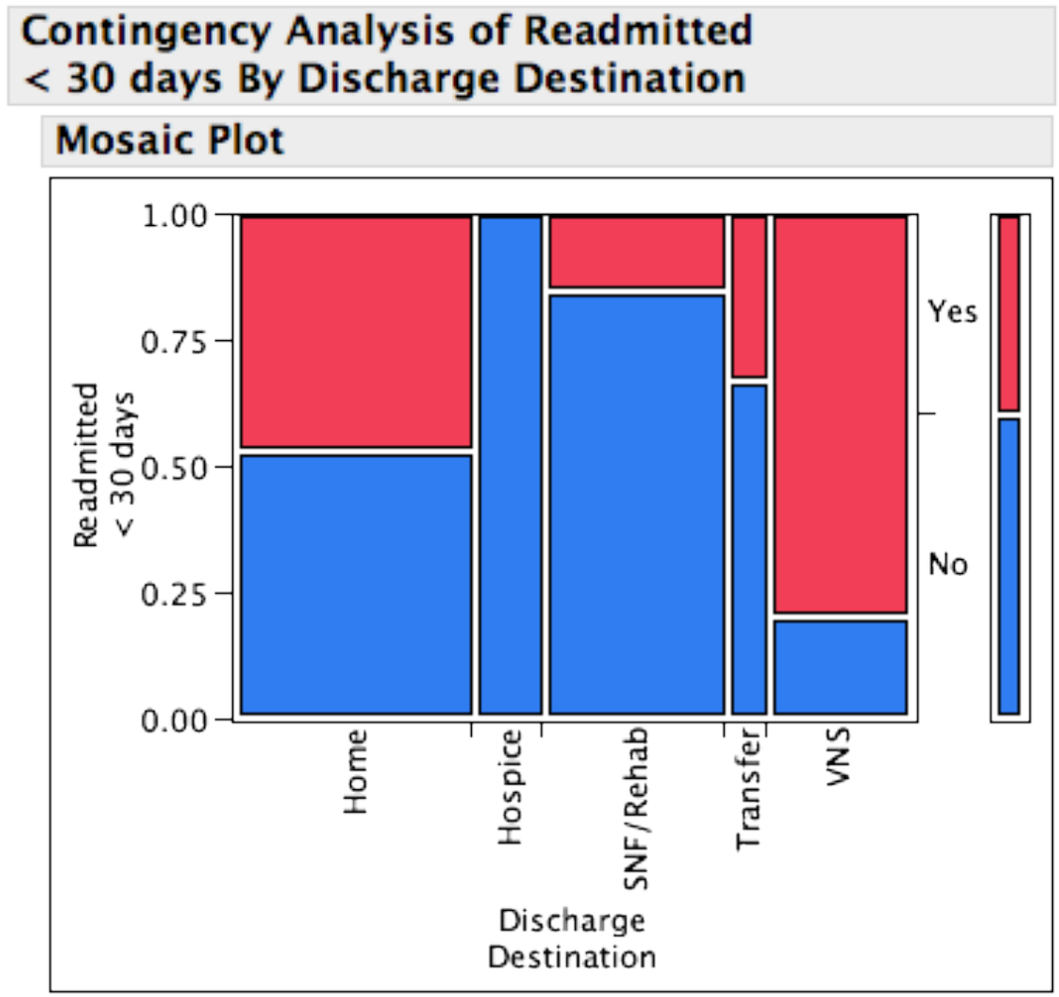
Quantiles		
100.0%	maximum	6
99.5%		6
97.5%		3
90.0%		2
75.0%	quartile	1
50.0%	median	0
25.0%	quartile	0
10.0%		0
2.5%		0
0.5%		0
0.0%	minimum	0

Readmissions accounted for 33.3% of total admissions for CHF

11 clients accounted for 54% of all readmissions over a two-year period

Discharge Destination

- 80% of clients who were discharged home with only VNS support were readmitted within 30 days.
- CMS only reimburses VNS for clients who are home-bound.
- About half of clients who went home, without VNS, were readmitted within 30 days of discharge.
- Only 18% were readmitted from Skilled Nursing Facilities



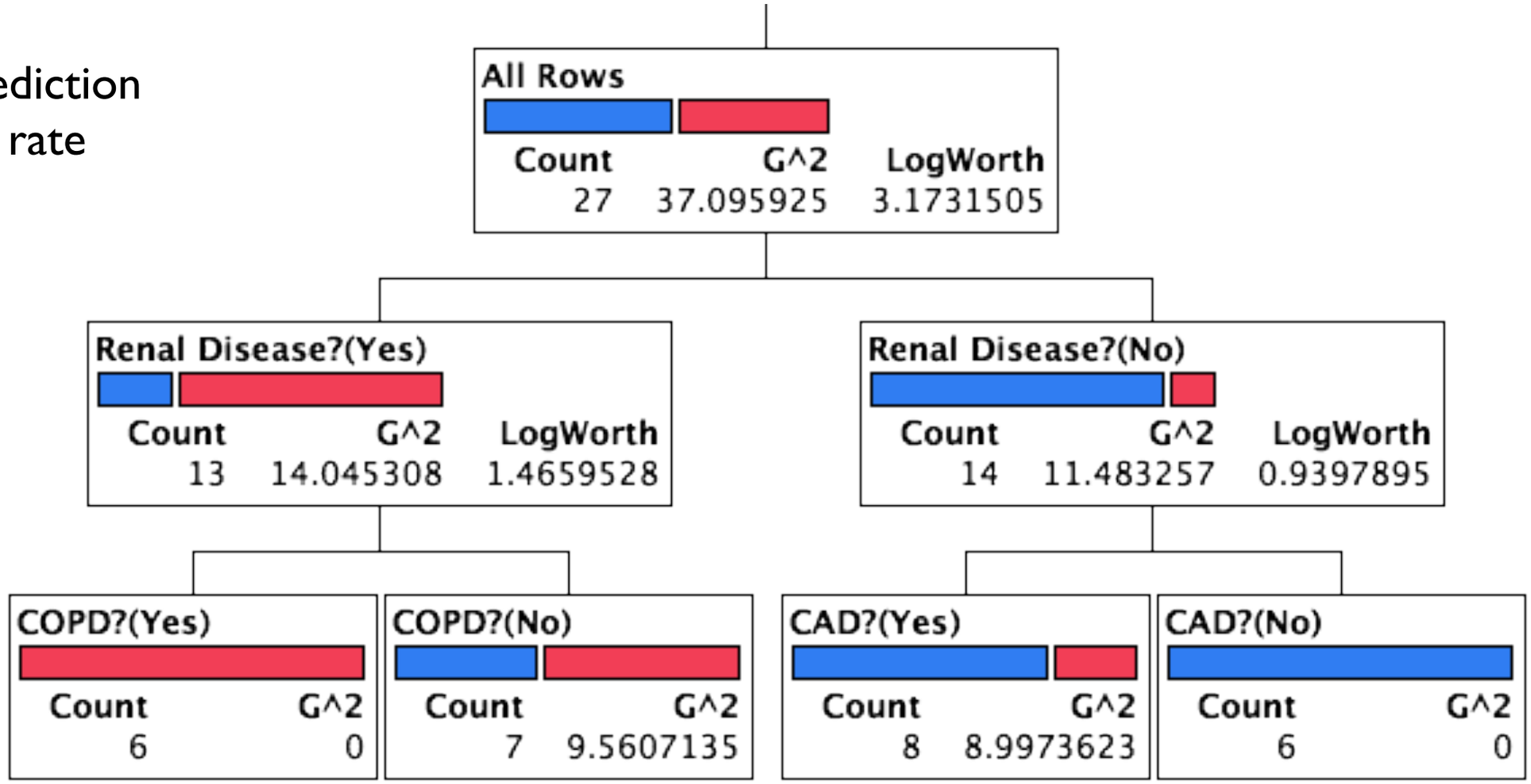
Predictive Models

- Neural Net Model
  - 95.7% prediction success rate
  - Most likely over-fit to the original data set
- Recursive Partitioning Models
  - 88% prediction success rate for all causes of readmission within 30 days of discharge
  - 85% prediction success rate for CHF readmissions

Contingency Map of Recursive Partition Model

Clients Readmitted for CHF Exacerbation < 30 Days

85% prediction success rate



All were readmitted

Many were readmitted

Few were readmitted

None were readmitted

Recommendations

- Predictive Models are Powerful Tools for...
  - Outcomes-based, Client-centered Care

- Care Management:
  - Use predictive models to assess the need to enroll clients in disease management programs [DMP], or be recommended to skilled nursing or hospice facilities
  - To improve their own financial outcomes, hospitals should: Encourage clients with a high risk of readmission from CHF to enter Skilled Nursing Facilities for rehabilitation, for 7 to 10 days.

- Interventions:
  - Focus interventions on clients' particular comorbidities by developing Multidisciplinary Care Plans based on Recursive Partitioning Models
  - Improve the quality of home-based services for high risk clients.

Discussion

- The MSA results underscore the degenerative nature of CHF and the inappropriate use of CHF DRG codes to measure or compare health outcomes, without additional qualifiers.
- Other disease-specific diagnostic definitions should be preferred to DRG codes for tracking health outcomes.
- The new ICD-10 codes may improve the reporting system.
- QI projects that create significant improvements in health outcomes may not always result in equivalent financial benefits.
- Payer mix and organization type may influence the financial feasibility and sustainability of QI initiatives.

Sample & Effect Size

- The sample size of clients (n=48) was small, and a power analysis revealed that not all minimal effects were possible to detect, given the sample size.
- However, statistically significant [measurable] effects were found for each sample.
- Clinically significant relationships were detected for each sample, due to a large effect size.
- A large effect size may justify the local use of QI information, even if the sample size is relatively small.

Limitations

- Confirmational Data Analysis [CDA] must be performed, once additional data is collected, to validate the neural net and recursive partitioning predictive models proposed for screening clients with CHF for high readmission risk.

  (Cox, Guadard, Ramsey, Stephens, & Wright, 2010)

- The specific elements and cut-off scores of predictive models used in QI are not generalizable across settings.

  (Melnyk & Fineout-Overholt, 2011)

- The data collected in retrospective chart reviews are not as reliable as those collected from designed experiments.

  (Cox, Guadard, Ramsey, Stephens, & Wright, 2010)

- During the retrospective chart review, additional variables were identified as potentially relevant predictors, including: Pro-BNP levels, BMI, anemia, BUN, and serum creatinine.

Conclusions

- QI leaders and researchers can not know the true effects of interventions, unless their measurements are reliable.
- Measurement reliability can be assessed for QI purposes, with Measurement Systems Analysis [MSA].
- The MSA showed that DRG codes serve as poor measures of diagnoses for specific admissions of clients with CHF.
- DRG codes can still be used for QI projects that aim to improve financial outcomes, because they directly influence reimbursement.
- Predictive models may serve as useful tools for targeting client populations, optimizing resource allocation, and improving both financial and health outcomes, within settings.

Implications for Nurses

- DMP, Floor, & Care Managers
  - Can screen clients to assess the type & intensity of services required
- Nurse-Practitioners- diagnostic purposes
- Clinical Nurse Leaders
  - Making the business case for QI
  - Avoid blanket policies for the use of limited resources, for cost-effective care

References

- Bhalla, R. (2010). Could Medicare readmissions policy exacerbate health care system inequity? *Annals of Internal Medicine 152*(2): 114-117. Retrieved from: http://www.annals.org/content/152/2/114.full

- Bosworth, H., Steinhauser, K., Orr, M., Lindquist, J., Grambow, S., & Oddone, E. (2004). Congestive heart failure patients' perceptions of quality of life: The integration of physical and psychosocial factors. *Aging & Mental Health, 8*(1), 83-91.

- Cox, I., Guadard, M.A., Ramsey, P.J., Stephens, M.L., & Wright, L.T. (2010). *Visual Six Sigma: Making Data Analysis Lean*. John Wiley & Sons, Inc: Hoboken, NJ.

- Daly, B., Genet Kelley, C., Douglas, S., O'Toole, E., & Montenegro, H. (2007). Chronically critically ill patients: Health related quality of life and resource use after a disease management intervention. *American Journal of Critical Care, 16*(5). Retrieved from www.ajcconline.org.

- Gladwell, M. (2006). Million-dollar Murray: Why problems like homelessness may be easier to solve than manage. *The New Yorker* (20), February 16th Issue.

- Green, M.A., & Rowell, J.C. (2010). *Understanding Health Insurance: A Guide to Billing and Reimbursement, 10th Ed*. Cengage Learning.

References, continued

- Hallerbach, M., Francoeur, A., Pomerantz, S. C., Oliner, C., Morris, D. L., Eiger, G., Cohn, J., & Goldfinger, M. (2008). Patterns and predictors of early hospital readmission in patients with congestive heart failure. *American Journal of Medical Quality: The Official Journal of the American College of Medical Quality, 23*(1), 18-23. Retrieved from Ebscohost.com.

- Harkness, K. (2002). Review: Specialized multidisciplinary follow up reduces hospital admissions but not mortality in patients with heart failure. *Evidence Based Nursing, 5*(1), 18-18. Retrieved from Ebscohost.com.

- McCoy, M., Davidhizar, R., & Gillum, D. (2007). A correlational pilot study of home health nurse management of heart failure patients and hospital readmissions. *Home Health Care Management & Practice, 19*(5), 392-396. Retrieved from Ebscohost.com.

- Melnyk, B.M., Fineout-Overholt, E. (2011). *Evidence-Based Practice, 2nd Ed.* Lippincott, Williams & Wilkins: Philiadelphia, P.A.

- Montgomery, D.C., Peck, E.A., Vining, G.G. (2006). *Introduction to Linear Regression Analysis, 4th Ed* John Wiley & Sons, Inc.: Hoboken, N.J.

- Ruddick, A., Liddle, A., Moore, M. (2010). Visual six sigma: Making data analysis lean. Catalyst Consulting, SAS Institute. Retrieved from www.jmp.com.

References, continued

- Song, E. K., Lennie, T. A., & Moser, D. K. (2009). Depressive symptoms increase risk of rehospitalisation in heart failure patients with preserved systolic function. *Journal of Clinical Nursing, 18*(13), 1871-1877. Retrieved from Ebscohost.com.

- Subramanian,S. (2010). Project BOOST: A return on investment analysis. *Society of Hospital Medicine*. Retrieved from Ebscohost.com.

- Thomas, M. (2007). Chronically critically ill patients: Health related quality of life and resource use after a disease management intervention. *Am J Crit Care* (16): 447-457. Retrieved from www.ajcconline.org.

- Thor, J., Lundberg, J., Ask, J., et al. (2007). Application of statistical process control in healthcare improvement: Systematic review. *Qual Saf Health Care*, (16): 387-399.

- United States Department of Health and Human Services [DHHS] (2010). Hospital compare: A quality tool provided by Medicare. Retrieved May 10th, 2010, from http://www.hospitalcompare.hhs.gov/Hospital/Search/compareHospitals.asp.

- Williams, N. (2003). Nurse led transitional care improved health related quality of life and reduced emergency department use for heart failure. *Evidence Based Nursing, 6*(1), 21-21. Retrieved from Ebscohost.com.