USING AN ELECTRONIC RULES-BASED SYSTEM TO IMPROVE PATIENT CARE RECEIVING NUTRITION SUPPORT

M. McMahon (US)
Benefits of Technology: Feeding Effectively Using Electronic Data (FEED)

M. Molly McMahon, MD
Professor of Medicine
Mayo Clinic
Rochester, MN
Benefit of Technology and Hospital Nutrition

• In the U.S., physicians are undertrained in nutrition and number focusing on nutrition is decreasing

• International survey reported similar results to U.S. survey re: med school teaching (~24 hr.)

• New specialties and other disciplines may be prescribers

• What is the potential benefit of focused technology?
ASPEN and Academy of Nutrition and Dietetics Survey

- Baseline and follow-up on-line surveys assessed safety and efficacy of nutrition content in Electronic Medical Record systems
  - Reported no improvement in safety and efficacy of nutrition content
  - Proposed a ‘call to action’ to collaborate with EMR vendors to enhance nutrition sections
Mayo System: Feeding Effectively Using Electronic Data (FEED)

Goals: Recognizing undertraining in nutrition, we created a system to:

• Standardize quality nutrition care using evidence-based guidelines
• Focus on safety
• Optimize efficiency of rounds and prioritize rounds
• Facilitate clinical research
Goals of our Nutrition Support Service

• Determine if nutrition support is indicated. If so, enteral or parenteral?
• Recommend tailored nutrition and cost-effective metabolic monitoring programs
• Minimize nutrition-related complications by daily review of patient’s clinical, nutrition, and metabolic status as well as drug-nutrient issues
• Protect time for clinicians with patients
Feeding Effectively Using Electronic Data (FEED)

- FEED was developed as a Mayo Clinic Hospital Rules-Based subsystem
- System integrates computerized data from many hospital data bases into one place that can be used by many subsystems
Hospital Rules-Based System Components

- Demographics
- Drug Orders
- Lab Results
- Micro Results
- Nutrition
- CBAM
- FEED
- SCCSL
- CBAM
- CBAM
Feeding Effectively using Electronic Data

• Nutrition physicians developed evidence-based guidelines for PN (calories, dextrose, protein, fat) for types of patients and ‘safe’ lab ranges

• Rules were incorporated into computerized logic algorithms by IT programmers

• Pharmacists developed list of meds with potential for drug-nutrient, tube feeding interactions, and/or metabolic/GI side-effects

• Automated calculations compute creatinine clearance, BMI, and Harris-Benedict equation
FEED: Process (cont)

• FEED tests rules daily and ‘flags’ patient’s name if PN formula and/or lab results are ‘out of range’

• Information (nutrition data, PN composition, and lab results) is used on rounds to determine which patients require further evaluation and to prioritize care
FEED: Rules Tested

- Calories (C) compared to Harris-Benedict (HB)
- Protein (P) based on body weight and as percent of total calories
- Fat (F) as percent of total calories
- Nutrient substrate (♦) – glucose, sodium, potassium, triglycerides, INR, and minerals
- Organ function (⑦) – renal and hepatic
- PN or IV insulin (I) – no glucose check past 24 hr.
FEED: Components

• NSS Consult Report

• Patient Detail Report. Format of report tailored to user allowing specific model for consultants.

• Calculator and PN formula design
### FEED - Feeding Effectively using Electronic Data

#### FEED Home | Maintenance | Calc | Issues | Help | User Options | News | Bulletin

**Date:** 01-Apr 2003 09:00  
**SMH NUTRITION SUPPORT SERVICES**

- PKT RD: 127-02380
- PXD RN: 127-04760
- PKS RN: 127-02141
- MEK RPh: 127-02526
- SAS PharmD: 127-04703

**WVE-RD: 127-2616**  
**WVE RPh: Call 0 for Decentral RPh**  
**WVE-RN Call 0 for on-call CNS or Pager: 287-3826**

- ◆ = Nutrient Substrate
- ● = Organ Function
- I = Ins/Glu
- C = Cal
- P = Pro
- F = Fat

#### FEED Home | Maintenance | Calc | Issues | Help | User Options | News | Bulletin

**Name:** McMahon, M. Molly, MD 4-6341

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**DX:** Acute Compartment Syndrome  
ENPN, Unable to Pice NG> CPN  
RX: BISACODYL, FAMOTIDINE, THIAMINE

**DX:** Brain Lesion, L Hemiplegia, Diabetes, Coagulopathy, Thrombocytopenia  
ENPN: NPO, NG- Stomach, R LJ-- Svc  
RX: CALCIUM CHLORIDE, DIAL YSATF HEMODIALTRATION
FEED: Components

• NSS Consult Report

• Patient Detail Report. Format of report tailored to user allowing specific model for physicians.

• Calculator and PN formula design
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<th>Sex</th>
<th>Weight</th>
<th>Height</th>
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<th>Location</th>
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**ADMISSION HISTORY** past 20 Days
- Previous admission:
- Previous discharge:

**NSS PATIENT DATA**
- Current Weight: KG
- BMI:
- ELW:
- HB:
- RBC:
- PC:
- RECR Date:

**DRUG ALLERGY**

**RULES** - Flags on (date)
**PARENTERAL NUTRITION - past 2 Days**

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### Base Components
- Amino Acids (T10)
- Dextrose
- FAT EMULSION 20%

### Electrolyte Totals Per Liter
- NA+
- K+
- CA++
- MO++
- CL-
- PO4-
- AC-

### Miscellaneous Additives
- MVI-12 (Vit/Vit)
- Adult Trace Elements
- Insulin, Req. Human
- Pancreatin, Mg

### PN Intake
- Total Calories: ___
- Calories as Fat: ___
- % of Total Calories: ___

**PN Type: Basic Date/Time Hung:***

### Laboratoty Results (FEED) - past 04 Hours - (– = below normal, + = above normal) - (â or Underlined = Lab footnote, click for details)

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LABORATORY RESULTS (McNahon, M. Molly) - past 48 Hours. (+ = below normal, ↑ = above normal). (© or Underlined = Lab footnote, click for details)

PATIENT NOTE - past 45 Days. Add Note

NON-ANTIBIOTIC ASSAYS - past 7 Days

ANTIBIOTIC ASSAYS - past 7 Days
### Patient Details

**Non Antibiotic Assays** - past 7 Days

**Antibiotic Assays** - past 7 Days

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<th>Name</th>
<th>Qty</th>
<th>Sched</th>
<th>Freq</th>
<th>Route</th>
<th>Date</th>
<th>Date</th>
<th>Date</th>
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**Microbiology** (> - flagged rule; ~unavailable susceptibility)
(Blood Cultures - 3 days; C Difficile Toxin - 7 days; Stool Cultures - 7 days)

**Operative Reports** - past 7 Days
FEED Medications

Medications on Consult Report

- Nutrition supplements: Electrolyte, mineral, and vitamin supplements
- Drug-nutrient: e.g., Amphotericin B and Dilantin®
- Endo: Insulin and glucocorticoids
- GI: Prokinetics, anti-diarrheals, and laxatives
- Other: Warfarin, posaconazole, and others
FEED: Components

• NSS Consult Report
• Patient Detail Report. Format of report tailored to user allowing specific model for consultants.
• Calculator and PN formula design
FEED: Calculator Function

Clinician determines volume and nutrition goals and calculator can design:

- Fluid-restricted central PN
- Maintenance volume central PN
- Osmolarity-controlled peripheral PN
FEED: Clinical Use

• Standardize approach among many prescribers

• Glucose management: review for overfeeding, PN dextrose, PN, IV, and SQ insulin, PN discontinuation, meds (propofol, glucocorticoids, sympathomimetics), CVVH, as well as glucose trends

• Volume excess: fluid-restricted PN

• Obesity: review PN calories and protein

• Hypertriglyceridemia: permissively underfeed
FEED: Clinical Use (cont)

• Propofol use: check Tg level and reassess IVFE amount

• Refeeding risk: review PN content and calories and electrolyte and mineral values

• CVVH or HD: review PN content with electrolyte and mineral values; assess PN protein and dextrose

• Review vitamin levels: present most recent value
Research Using FEED

• Value of our NSS: 15 year experience 2000-2014
  ↓’d PN use and ↑’d tube feeding
  ↓’d short-term PN use duration
  ↓’d PN dextrose calories, glucose amount, and ↑’d protein amount

• Triglyceride studies

• CVVH studies
Summary

• Integrate information to improve team efficiency and prioritize patient care on daily rounds

• Standardize nutrition approach while educating house-staff and others

• Save time gathering data to allow more direct patient care – what clinicians do best!
  • U.S. studies report impact of documentation on physician burn-out

• Re-create system for new Electronic Medical Record (add tube feeding program, all fluids)
Selected References


• Frazee EN, Koopman EM, McMahon M, Miles J. Relationship between hypertriglyceridemia and body mass index in patients receiving parenteral nutrition. JPEN J Parenteral Enteral Nutr 2011;Jan;35:47.
Selected References


• Jaksic T, McMahon MM, Ziegler T, Mechanick J. Defining the roles and responsibilities of medical, surgical, and nutrition societies for conducting research and providing medical education in nutrition. JPNEN J Parenter Enteral Nutr 2010;1 suppl:63S-69S.
Selected References


Selected References
