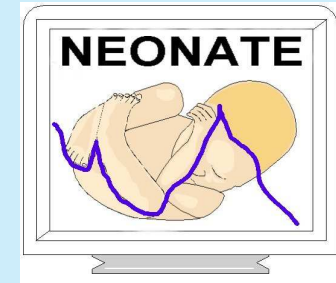


# ECAI 2002: IDAMAP

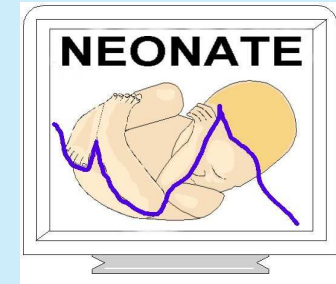


## A New Measure Summarising 'Information' Conveyed in Cluster

### Analysis of Card-Sort Data: Application to a Neonatal Intensive Care environment

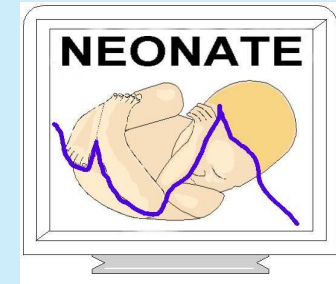
G. Ewing, R. Logie, J. Hunter, N. McIntosh, S. Rudkin, Y. Freer and L.  
Ferguson

# Context



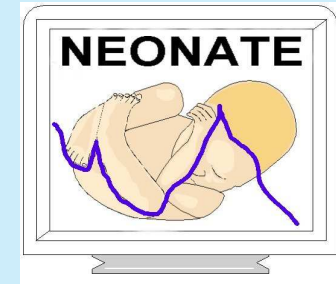
- **Initial effort in project, NEONATE, to develop decision support for clinical staff;**
- **How can computer-based decision support improve patient care in neonatal intensive care units.**

# Elicitation of Terms



- Need for an agreed lexicon of terms to describe the actions carried out and the relevant sensory data (descriptors).
- Desirable to investigate relationships between terms for optimal data input.
- Interviews to elicit clinical actions (~70) and patient descriptors (552).
- Subjects (32) : 8 JN, 8 SN, 8JD, 8 SD.
- SME vetted actions (51) and descriptors lists (132);
  - Removal of singletons and synonyms.

# Actions



**Care**

**Collect data**

**Chest drains**

**Communication**

**Feeding**

**Investigations**

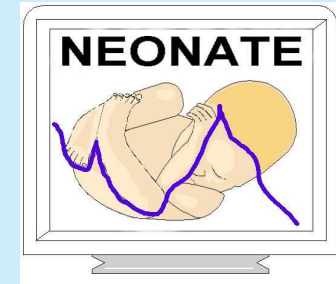
**Lines**

**Respiration**

**Safety**

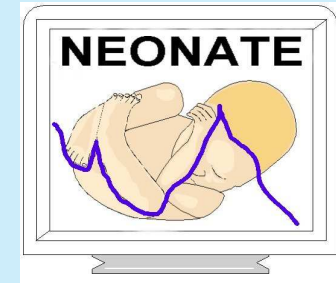
**Therapy**

# Card-Sorting



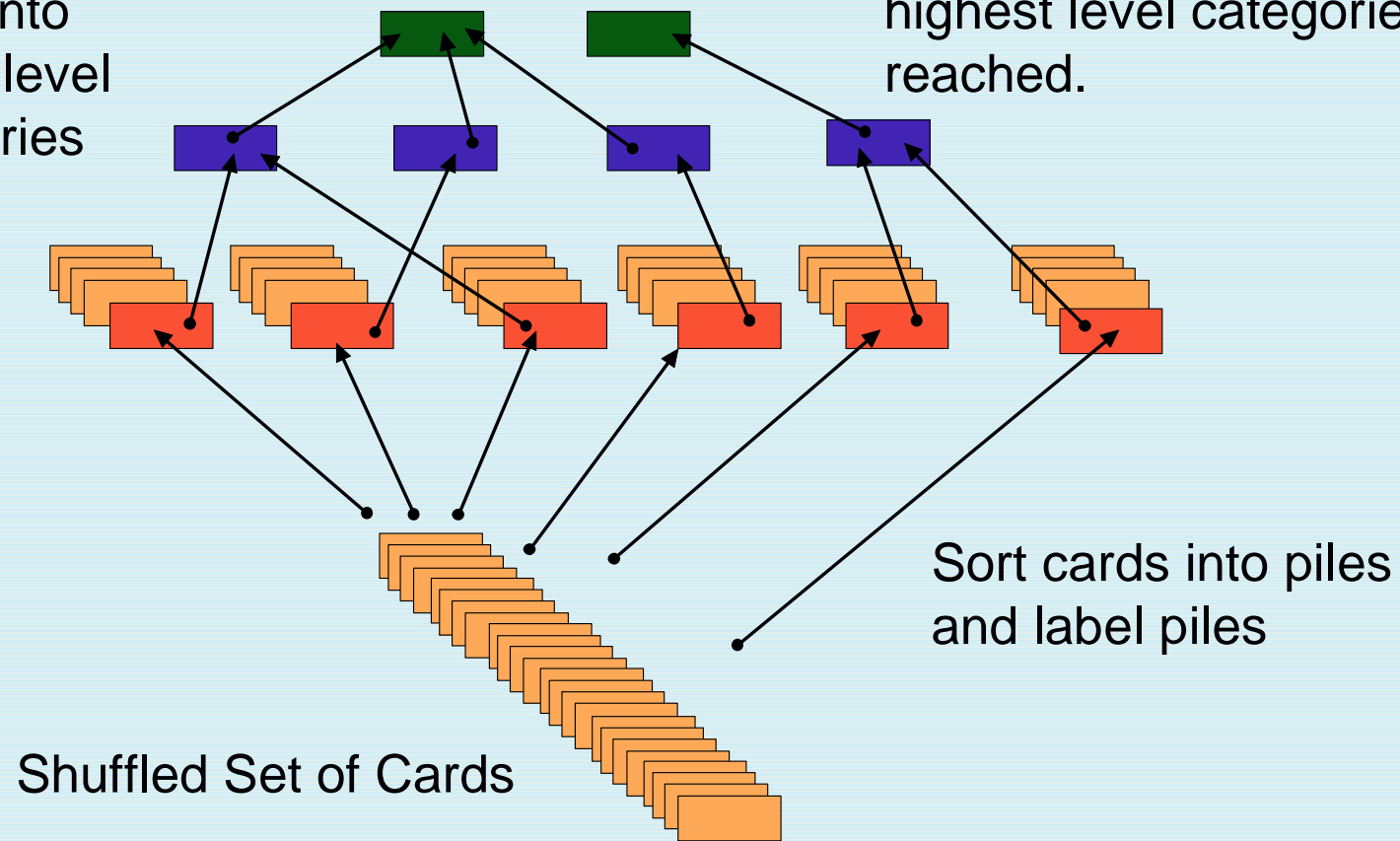
- "Concept Sorting" is a well-known technique.
- A flexible method to label the basic categories and to reach an agreement on a conceptual structure.
- SME sorts cards into piles (values) according to different criteria (attributes).
- Cognitive psychology studies have shown that this is very efficient elicitation technique.

# Card-Sorting Procedure

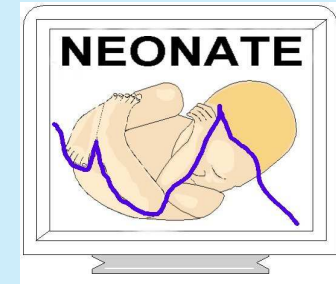


Merge label cards into higher level categories

Continue process until highest level categories reached.

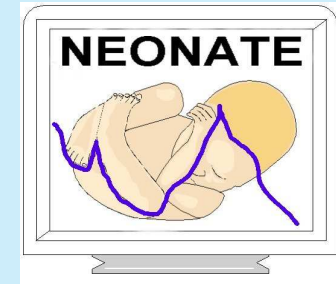


# Card-Sorting Experiments



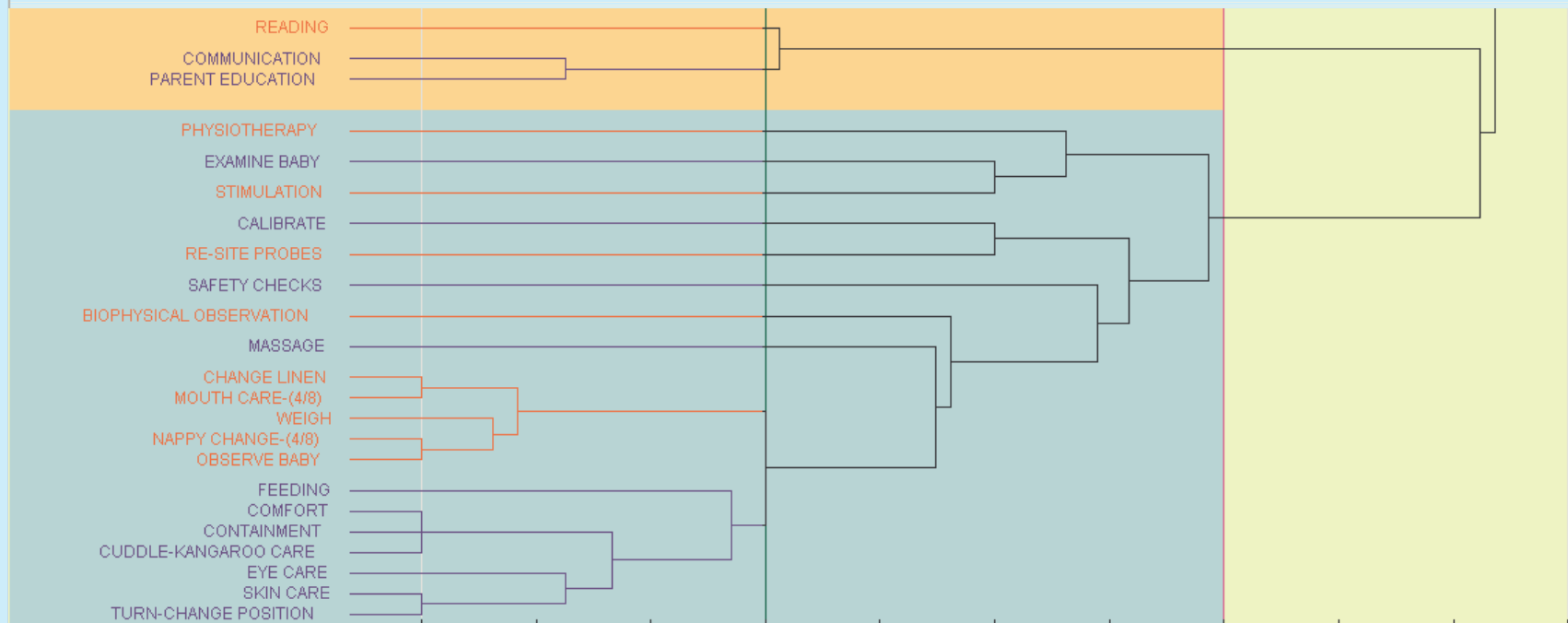
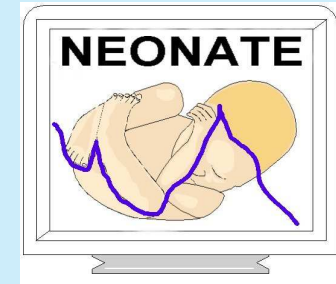
- “Actions” card-sorts: Subjects (32) : 8 JN, 8 SN, 8JD, 8 SD (completed),
  - 2 sorts per subject (at different times);
  - Approx. 1 hours per session.
- “Descriptor” card-sorts: Subjects (32) : 8 JN, 8 SN, 8JD, 8 SD (in progress, 1st sort 2/3 complete),
  - 2 sorts per subject (at different times)'
  - Approx. 1.5 hours per session;

# Analysis of Results



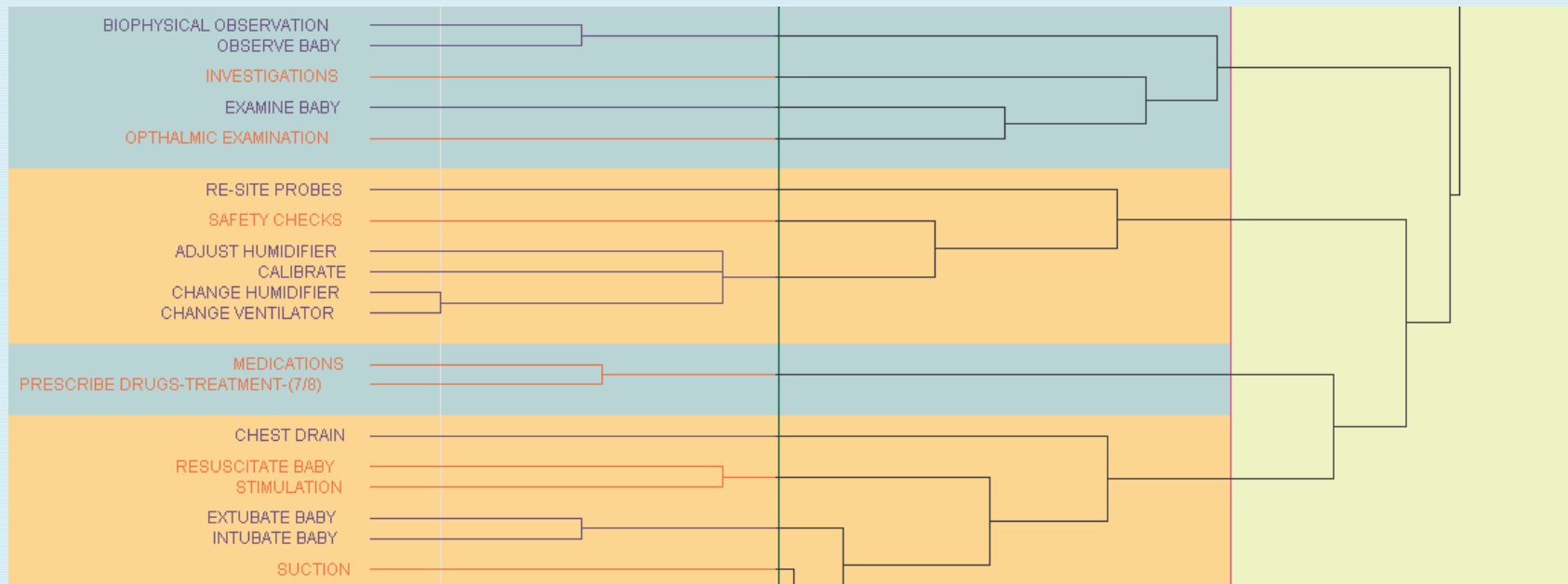
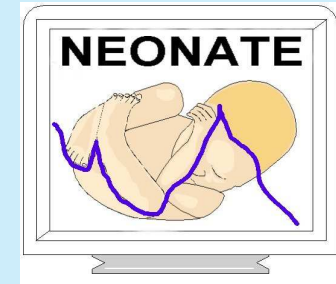
- Card-sorts were analysed by cluster analysis;
- Dendrograms produced;
- Summary graphs were developed;
- Information measures were developed.

# Dendrogram JN



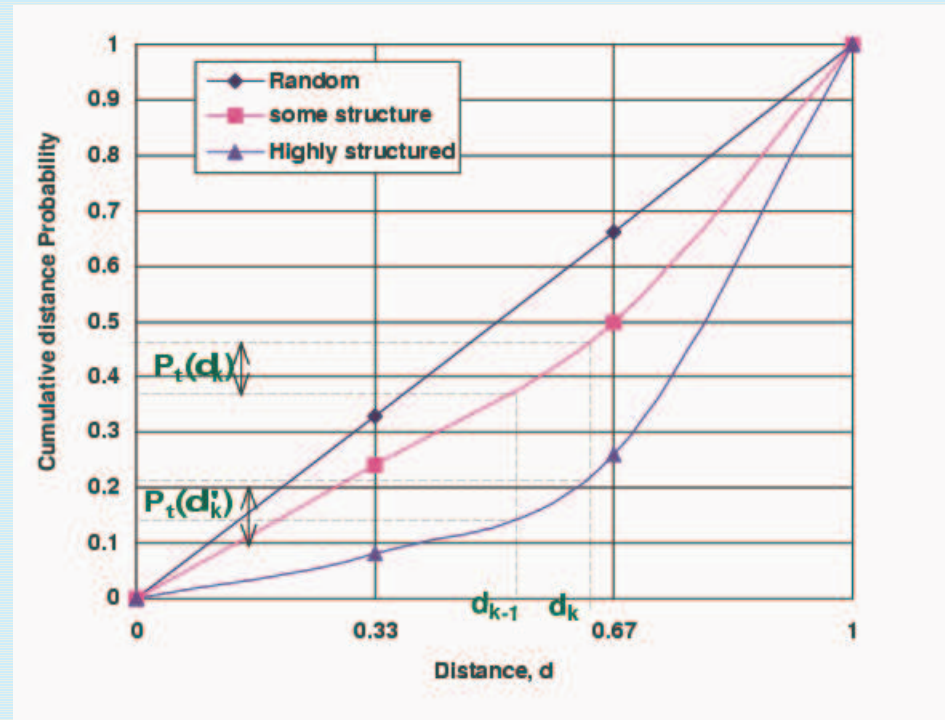
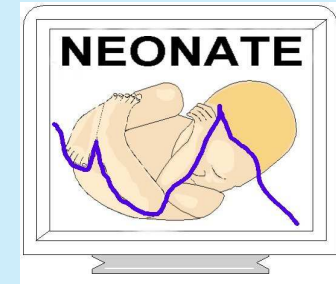
**“Actions” dendrogram for junior nurses.**

# Dendrogram SD



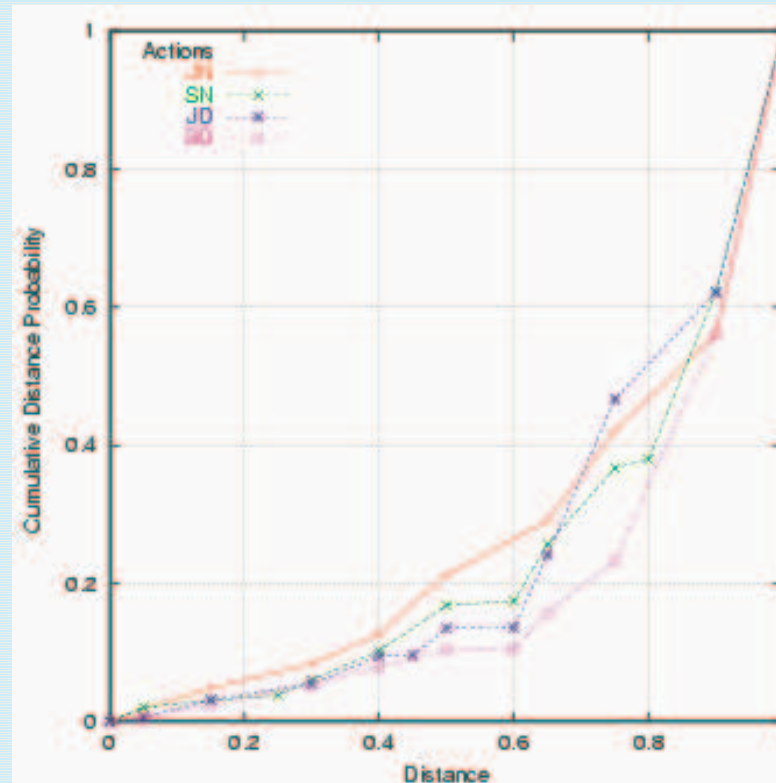
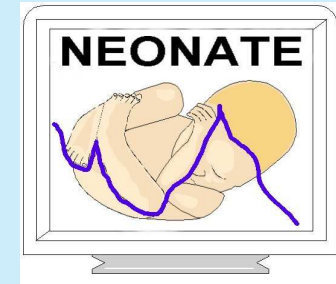
**“Actions” dendrogram for senior doctors.**

# Graphical Summary



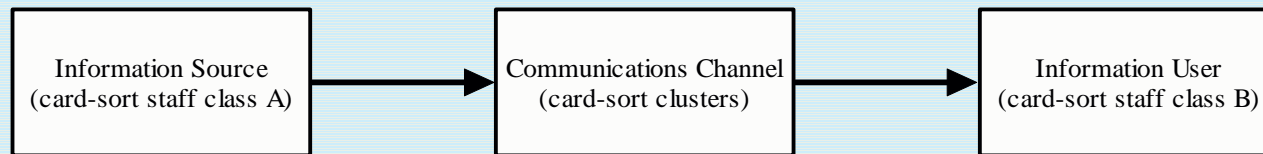
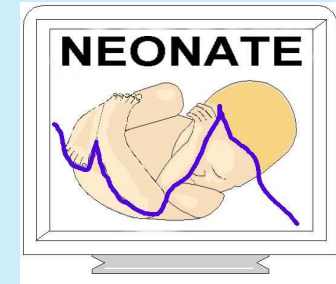
**Stylised Graphical Summary of Dendrogram Structure**

# Graphical Summary 2



**Graphical Summary of (actual) Dendrogram Structure**

# Information Channel

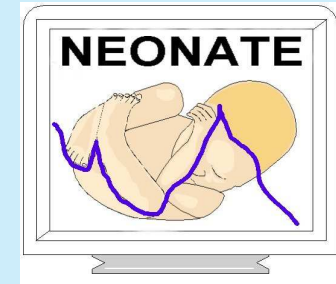


Channel matrix  $Q = q_{ki}$

Alphabet,  $A = \{a_i\}$ ,  $N$   
symbols  
probability of  $a_i = P(a_i)$

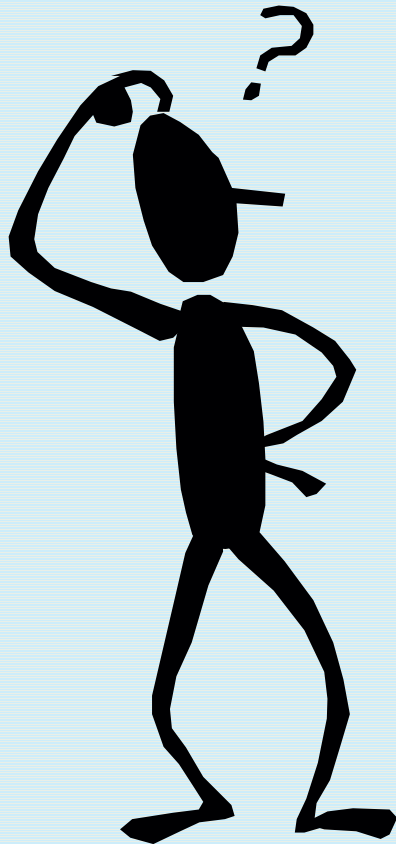
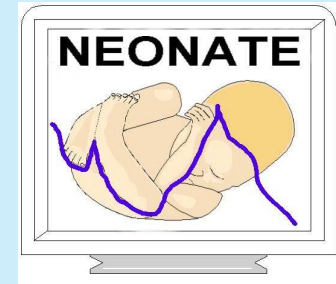
Alphabet,  $B = \{b_k\}$ ,  $M$   
symbols  
probability of  $b_k = P(b_k)$

# Results: Mutual Information Measures



Staff Class	JN	SN	JD	SD
JN	0.00	0.32	0.31	0.47
SN		0.00	0.29	0.48
JD			0.00	0.43
SD				0.00

# Questions?



# Neonatal ICU Data

