

Human Factors Improvement Series

LABELS

This tool has been developed to facilitate a unit's assessment of human factors involved with the design and use of labels in healthcare environment. The intent is to provide guidance for the purpose of improving patient safety.

Human Factors of Labels

Labels communicate a range of essential information – from patient identification to physiological status or drug dosage. The way in which this information is visually presented is important in minimizing the risk of error^{2,7}.

Perception is not just the automatic translation of what we see. We often infer or assume meaning based on our expectations, the context of the present situation or what has happened in the recent past¹³. Making the visual presentation of information as clear and unambiguous as possible is essential to ensure that the correct meaning is understood.

Under ideal conditions most labels will appear adequate. Unfortunately there are times when conditions are not ideal; lighting is low, labels are partially obscured or glare disrupts the image. The demographics of most organizations suggests that aging will further heighten the need for a cautious approach to how information is presented with a decline in visual acuity with age⁴.

Attention to human factors of labels and displays will help to reduce the likelihood of error. Other aspects of labels are also important such as the process for ensuring that correct labels are applied, education on the content of labels, the appearance and design of supplier packaging and the use of bar code labeling systems. This tool addresses human factors related to how information appears on the label. It is important to recognize that addressing label characteristics alone will not assure safety and other control measures should be used whenever possible.

Examples of labels include: Medication labels, blood products, food products, specimens, embossing cards, patient ID, equipment labels, tubes, and containers.

Labels – Human Factors Principles

The visual presentation of information requires a consideration of the physical characteristics - how information is presented - in order to ensure that it is communicated with the least possibility for error. The following principles apply to all forms of visual communication including labels and device displays. These principles will serve as a guideline as you work through the self-assessment tool. Although many of these characteristics may be intuitively obvious they are based on research reported in the human factors and applied psychology literature.^{2,5-13}

The principles are organized based on these three considerations:⁷

- ◆ Design of message: physical features of the label or display (e.g. typeface, size)
- ◆ Message transmission: environmental factors (e.g. viewing angle, lighting)
- ◆ Message receipt: personal factors (e.g. visual ability, situation knowledge)

Design of Message

Legibility of the message on a label affects the user's ability to discriminate among or recognize letters, numbers and other characters. It is influenced by shape, size, contrast, color and the quality of printing.

- ▲ Use simple and familiar fonts. **Sans-serif fonts (e.g. arial)** are more legible than serif fonts (e.g. times new roman)
- ▲ Avoid fonts that have characters that are too similar (e.g. letter - O and zero - 0)
- ▲ Use of ALL UPPER case letters reduces legibility and should be avoided unless the text is brief.
- ▲ Limit the use of bold or italic type.
- ▲ See Table 1 for character height and viewing distance.

Table 1 Text Size and Viewing Distance

Viewing Distance	Character Height
28 in. (0.7 m)	2 - 5 mm
3 ft. (0.9 m)	3 - 7 mm
6 ft. (1.8 m)	7 - 13 mm
20 ft (6.1 m)	22 – 43 mm

Note: measure the height of the smallest character (e.g. a, x if lower case used) and increase by 50% in low light levels.

- ⤴ Color combinations (the most important consideration is to maintain high contrast between lettering and background):

Best

Black letters on a white background
Black on yellow

Good

Dark blue on white
Green on white
Yellow on Black
White on Black

Avoid using black over dark red, green and blue

- ⤴ Avoid the use of color in low-light conditions. Do not rely on color as the only distinguishing characteristic – provide redundancy to ensure meaning is clear.

Readability refers to the ease of reading words or numbers when the individual characters are legible.

- ⤴ Avoid the use of italics or bold for long strings of text.
- ⤴ Vertical space between lines should be greater than 25% of the overall font height.
- ⤴ Use ink that will not smear under conditions of use
- ⤴ Labels should be printed on non-glossy paper. If labels are protected by plastic it should have a matte finish to reduce glare.
- ⤴ Ensure that the placement of labels on curved surfaces does not distort text to adversely affect legibility.
- ⤴ Place labels in a position that will minimize damage to the message.
- ⤴ Highlighter, borders or underlining can be used for emphasis but should not distort the message text or be the only distinguishing characteristic.

- ⤴ Icons can be an effective supplement to printed text when they are unambiguous and universally understood. Icons should not be used alone; always provide the associated text description to reduce confusion.
- ⤴ Bar code labels must also include readable text.

Message Transmission

- ⤴ Labels and displays should be viewed at 90 degrees to the line-of-sight.
- ⤴ Labels and displays should be oriented horizontally or easily moved to that position.
- ⤴ Task lighting should be available for reading labels when ambient lighting is maintained at low levels.

Message Receipt

Comprehensibility is a measure of how reliably someone interprets a message. It depends on prior knowledge, language skills, expectation, habit, routine, location and the context in which the message is viewed.

- ⤴ Keep messages on labels brief and concise.
- ⤴ Avoid ambiguous words and abbreviations.
- ⤴ Provide redundancy in the message (e.g. name *and* I.D. number; supplement color-coding and symbols with text).
- ⤴ Conduct tests to evaluate new labels; have someone read labels to verify clarity of meaning.
- ⤴ For items that look similar, add unique markings and store in separate places. (N.B. This is particularly important when examining supplier packaging.)
- ⤴ Standardize label information content and layout when used for similar materials and situations.
- ⤴ Analyze the context of label reading to identify potential errors.

Self-assessment Process

Preparation

Before you begin a walk-through assessment it will be helpful to:

- Identify and obtain all relevant policies, procedures, guidelines and protocols directing the use of labels.
- Compile an inventory of all labels in the unit.
- Identify any recently recorded incidents or near misses involving labels.
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Assessment Team

Responsibility and job titles may vary in your unit – use discretion in forming the assessment team but include people in-the-know and those who have the authority to make changes.

The core team should include those people in your unit who are involved in the creation and use of labels: nurse, clerical support, pharmacist, other support personnel.

Ad hoc members: physicians, nurse educator, administrative leader, purchasing representative.

Responses

Grade your assessment under each question using this scale. Your responses will not be evaluated but rather used by you to help plan and direct necessary changes to improve patient safety. Each question has sub-points to guide your assessment.

- A.** This characteristic is adequate at this time.
- B.** This characteristic is being modified or changed.
- C.** This characteristic requires further investigation.
- D.** This characteristic is not adequate.

For each of the questions note if there have been any incidents or near misses in your unit related to the question topic.

Record potential action points or further investigation requirements while conducting the assessment.

HUMAN FACTORS SELF-ASSESSMENT TOOL

Labels

Point of Care Ergonomics

Are processes established to ensure correct labels are applied?

- Prepared labels are accessible and well marked.
- Label printing equipment and materials are organized and marked to minimize confusion.

Grade: _____

Notes:

Are labels legible and readable?

- Labels follow principles for legibility and readability.
- Verify this by finding and examining labels in-use.
- The conditions of use do not damage labels or otherwise interfere with readability.
- Bar code labels include readable words corresponding with the code information.
- Labels used to convey similar information are standardized in appearance and layout.

Grade: _____

Notes:

Are product labels unique and clearly marked?

- Labels with similar color schemes are supplemented with clear and unique markings and stored separately.

Grade: _____

Notes:

Point of Care Environment

Is there adequate ambient or task lighting available to read labels?

- Overhead room lighting is adequate when on and supplemented with task lighting if required.

Grade: _____

Notes:

Individual Human Factors

Are staff familiar with human factors principles for message design, transmission and receipt?

- Are hand-made or non-standard labels consistent with human factors principles?

Grade: _____

Notes:

Are staff aware of their personal vision characteristics and do they make adjustments to accommodate?

- Staff know how to adjust lighting if required.
- Staff know when to adjust displays to meet their visual capacity and when displays should remain standard.

Grade: _____

Notes:

Team and Group Factors

Is there a process for communicating changes in labels or displays?

- Staff alert each other about changes they make in labeling.
- Label content and layout is standardized whenever possible.

Grade: ____

Notes:

Are people using standard abbreviations, symbols and color codes?

- Use of abbreviations is avoided (preferred) or standardized.
- Symbols and color are only used to supplement a message that is also provided in words.

Grade: ____

Notes:

Organizational and Management Factors

Does the selection and implementation of labeling systems and devices consider human factors and the potential for error?

- Human factors principles are used as criteria in the selection process.
- Trials of labels and devices include evaluation of legibility, readability and other human factors in consideration of error potential.

Grade: ____

Notes:

Is compliance with established procedures for labels and displays periodically reviewed?

Grade: ____

Notes:

References

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