

# Design Guidance

## Time Display

Thursday, 28 January 2010  
Version 3.0.0.0

*Prepared by*  
**Microsoft**

## PREFACE

### Documents replaced by this document

Document Title	Version
Design Guidance – Time Display	2.0.0.0
Design Guidance – Time Display	1.0.0.0

### Documents to be read in conjunction with this document

Document Title	Version
Design Guidance – Date and Time Input	3.0.0.0
Design Guidance – Date Display	3.0.0.0
Design Guidance – Accessibility Principals	1.0.0.0
Design Guidance – Accessibility Checklist	1.0.0.0

This document and/or software ("this Content") has been created in partnership with the National Health Service (NHS) in England. Intellectual Property Rights to this Content are jointly owned by Microsoft and the NHS in England, although both Microsoft and the NHS are entitled to independently exercise their rights of ownership. Microsoft acknowledges the contribution of the NHS in England through their Common User Interface programme to this Content. Readers are referred to [www.cui.nhs.uk](http://www.cui.nhs.uk) for further information on the NHS CUI Programme.

All trademarks are the property of their respective companies. Microsoft and Windows are either registered trademarks or trademarks of Microsoft Corporation in the United States and/or other countries.

© Microsoft Corporation 2010. All rights reserved.

# TABLE OF CONTENTS

<b>1</b>	<b><i>Introduction</i></b> .....	<b>1</b>
1.1	Customer Need .....	1
1.2	Scope .....	2
1.2.1	In Scope .....	2
1.2.2	Out of Scope .....	2
1.3	Key Principles .....	2
<b>2</b>	<b><i>Recommendations and Guidance</i></b> .....	<b>4</b>
2.1	Exact Time .....	4
2.1.1	Guidance .....	5
2.1.2	Examples of Correct Usage .....	5
2.1.3	Examples of Incorrect Usage .....	6
2.1.4	Rationale .....	6
2.2	Approximate (or “Fuzzy”) Time .....	7
2.2.1	Guidance .....	7
2.2.2	Examples of Correct Usage .....	7
2.2.3	Examples of Incorrect Usage .....	7
2.2.4	Rationale .....	7
2.3	Time Duration .....	8
2.3.1	Guidance .....	8
2.3.2	Examples of Correct Usage .....	9
2.3.3	Examples of Incorrect Usage .....	9
2.3.4	Rationale .....	9
<b>3</b>	<b><i>Document Information</i></b> .....	<b>11</b>
3.1	Terms and Abbreviations .....	11
3.2	Nomenclature .....	11
3.2.1	Body Text .....	11
3.2.2	Cross References .....	11
3.3	References .....	12

# 1 INTRODUCTION

This document provides the design guidance for time display. It describes the area of focus, provides guidance and recommendations, and explains the rationale behind the guidance and recommendations.

This document is intended for use by anyone whose role includes screen design, or the implementation or assessment of clinical applications. This document can therefore be used as guidance for the specification of time display within the user interface of a clinical application.

Table 1 describes the changes made since the previous version of this guidance (Baseline version 2.0.0.0 dated 05-Aug-2008):

Change	IDs	Change Description
<b>Deleted</b>	D+Tb-0019 to D+Tb-0025	Replaced by D+Tb-0033 and D+Tb-0034
<b>Modified</b>		Clarification of definitions for in scope (section 1.2.1)
		Context clarification and 'Durations shorter than a second' in out of scope (section 1.2.2)
		Context clarification for illustrations (section 2)
	D+Tb-0001	Added 'only'
	D+Tb-0018	Modified to show 60 as a whole number rather than 90
<b>Added</b>	D+Tb-0032	Indicating use of 24-hour clock
	D+Tb-0033	Definition of labels for periods of time
	D+Tb-0034	
		Extra usage example for durations over 24-hours (section 2.3.2)

Table 1: Changes Since the Last Baseline Version

## 1.1 Customer Need

The display of exact times, approximate times and durations within software applications has inherent risks of misinterpretation based on how these values are displayed. Currently, due to the lack of specific time display standards for clinical applications, there is considerable variation in the way in which time display is implemented across systems. Due to this inconsistency, risks to effective clinical care and to patient safety arise.

### Inconsistency across systems

Currently, clinical systems used across care settings, differ in the way time is displayed. For example, during a review of clinical systems, a mix of both 24-hour and 12-hour time display formats were found to be used. Inherent within this is the risk that healthcare professionals moving between clinical systems made by different suppliers can misinterpret time, leading to patient safety incidents.

### A balanced approach to patient safety

There is a clear argument that unambiguous time display would reduce the potential for human error leading to patient safety incidents. The guidance provides evidence of clinical safety either through primary or secondary sources.

## 1.2 Scope

### 1.2.1 In Scope

This document provides guidance and recommendations for the following types of time display:

- Exact time – the precise time of an event
- Approximate time (or “fuzzy time”) – the estimated time of an event if the exact time is unknown
- Time duration – a period of time

The guidance also includes the display of date and time combinations.

### 1.2.2 Out of Scope

This section defines areas that are not covered in this guidance. Although there may be specific risks associated with these areas that are not addressed in this guidance, it is likely that the principles in this guidance will extend to the display of time in many of the areas listed below.

The following subject areas have not been considered in the development of this guidance:

- **Time entry** – Guidance on entering times is described in *Design Guidance – Date and Time Input {R1}*
- **Durations shorter than a second** – The shortest period of time described in this document is a second. Fractions of a second are not considered
- **Date display** – This document only applies to the display of time. Guidance on displaying dates is described in *Design Guidance – Date Display {R2}*
- **Labels** – In addition to the time format, an important factor for clarity is the display of unambiguous and consistent labels for times
- **Synchronisation** – Synchronising current time across clinical systems, applications, desktops and hospital clocks is not considered to be an issue in this guidance
- **Display styles** – Choice of display font size, background and foreground text colour will affect the readability of time as it will with all other displayed text. This document does not address general rules for text display
- **Data storage** – The guidance relates only to the display layer of a software application, and does not prescribe the way in which time values should be stored. We assume that any clinical Information Technology (IT) system is capable of transforming the stored time format into the displayed time format without error

#### Note

Listing an item as out of scope does not classify it as unimportant. Project time and resource constraints inevitably restrict what can be in scope for a particular release. It is possible that items out of scope for this release may be considered for a future release.

## 1.3 Key Principles

The following key principles reflect the critical areas of guidance discussed within this document:

- Enable all time information to be represented explicitly and completely, eliminating the occurrence of ambiguous times
- Reduce the possibility of misinterpreting the time as a date or other information display
- Maximise the readability of the time by the use of clear separators between time elements

- Support application scenarios where the user needs to enter and view an approximate time or duration
- Promote consistency across clinical applications by providing a small set of valid formats

## 2 RECOMMENDATIONS AND GUIDANCE

### Important

The visual representations used within this document to display the guidance are illustrative only. They are simplified in order to support understanding of the guidance points. Stylistic choices, such as colours, fonts or icons are not part of the guidance and unless otherwise specified are not mandatory requirements for compliance with the guidance in this document.

### 2.1 Exact Time

This section provides guidance for the display of exact times. Exact times display both hours and minutes, but may optionally also display seconds.

Figure 1 illustrates the required display format of an exact time without seconds. The required format is HH:mm (this notation follows the .NET Framework Standard DateTime Format Strings specification).

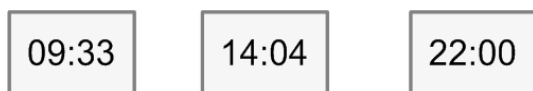


Figure 1: Examples of the Recommended Time Display Format for NHS Clinical Applications

Figure 2 illustrates the guidance for displaying exact times with seconds. The required format is HH:mm:ss.

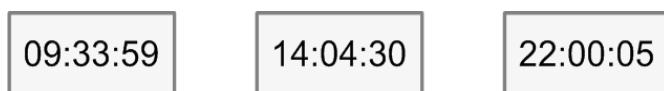


Figure 2: Examples of the Recommended Time Display Format for NHS Clinical Applications, Including Seconds

Time may be displayed alongside a date to indicate a combined date and time. For more details on the date display format, please refer to the document *Design Guidance – Date Display {R2}*. The following scenario is an example where date and time may be displayed together.

*“The midwife or attending clinician updates the maternity record with the final labour details. They use a structured entry form to record the newborn date and time of birth as Wednesday 14 June 2006 at 10:20 in the morning.”*

In this scenario, after the user has entered the information, the date and time would be displayed in combination.

Figure 3 illustrates the guidance for displaying combined dates and times.



Figure 3: Examples of the Recommended Date and Time Display Format for Clinical Applications

A pair of time displays may be used to express a time range, for example, the start and end times of an event. The elapsed time between them may be expressed as a time duration (see section 2.3).

## 2.1.1 Guidance

ID	Guideline	Status
D+Tb-0001	Display time using the 24-hour clock only	Mandatory
D+Tb-0032	Provide indication to the user that the 24-hour clock is in use	Mandatory
D+Tb-0002	Display an exact time as HH:mm	Mandatory
D+Tb-0003	Display hours using two digits (values less than 10 should appear with a zero in the first position)	Mandatory
D+Tb-0004	Display minutes using two digits (values less than 10 should appear with a zero in the first position)	Mandatory
D+Tb-0005	Display seconds as two digits (values less than 10 should appear with a zero in the first position)	Mandatory
D+Tb-0006	Separate the hours and minutes with a colon	Mandatory
D+Tb-0007	Separate the minutes and seconds with a colon	Mandatory
D+Tb-0008	Separate date and time values with a white space	Mandatory
D+Tb-0009	Display midnight as 00:00	Mandatory
D+Tb-0010	Display the last minute in the day as 23:59	Mandatory
D+Tb-0011	Display null times using an appropriate value, for example, 'Unknown' and 'Not recorded'	Mandatory
D+Tb-0012	Display seconds only if required	Recommended
D+Tb-0013	Display time ranges as two adjacent time displays, each identified by a contextually appropriate label, such as 'From' and 'To'	Recommended

Table 2: Guidance – Exact Time Display

## 2.1.2 Examples of Correct Usage

Usage	Format	Example	Comments
✓	HH:mm	12:35 04:59 00:25	Display format for hours and minutes only. Use this format for exact times that are accurate to the minute
✓	HH:mm:ss	12:35:01 04:59:58 00:25:12	Display format for hours, minutes and seconds. Use this format for exact times that are accurate to the second
✓	Day dd-MMM-yyyy HH:mm	Mon 12-Jun-2006 02:30 Fri 24-Apr-1998 10:45 Sun 05-Sep-2000 17:13 Sat 01-Dec-1970 00:05	Time display combined with long date display
✓	dd-MMM-yyyy HH:mm	12-Jun-2006 02:30 24-Apr-1998 10:45 05-Sep-2000 17:13 01-Dec-1970 00:05	Time display combined with short date display

Table 3: Correct Exact Time Formatting Examples



### 2.1.3 Examples of Incorrect Usage

Usage	Format	Example	Comments
✘	hh:mm AM	12:35 AM 12:35 PM	Use of the 12-hour clock
✘	HH mm HH.mm	12 35 12.35	Use of incorrect separator
✘	HH:mm	24:00	Since 00:00 is identical to 24:00, the display must never show 24:00
✘	HH:m h:m h:m:s	10:5 1:7 3:5:8	Lack of a leading zero for values less than 10
✘	dd-MMM-yyyy-HH:mm dd-MMM-yyyyHH:mm dd-Mmm-yyyy:HH:mm	12-Jun-2006-02:30 24-Apr-199810:45 05-Sep-2000:17:13 01-Dec-1970T00:05	Incorrect field separation makes these examples difficult to read

Table 4: Incorrect Exact Time Formatting Examples

### 2.1.4 Rationale

The main justification for use of the 24-hour clock is patient safety. The 24-hour clock is the standard notation used by most safety-critical industries, and there are clear benefits in sharing best practice between these industries. Moreover, evidence from the Patient Safety Assessment for date and time revealed a number of high risk issues associated with the use of the 12-hour clock, predominantly concerning the potential for confusion between noon and midnight and, more generally, the confusion that would arise were both notations to be supported. In addition, user research with clinicians and administrators found unanimous support for the 24-hour clock format over the 12-hour clock format.

Additionally, the guidance in this document aims to display times in a manner that:

- Is easily readable and unambiguous
- Clearly differentiates between hours, minutes and seconds
- Is consistent and concise (requiring fewer characters than the 12-hour clock)

During the creation of this guidance, the following standards were reviewed:

- International Organization for Standardization (ISO) 8601: 2004: Data elements and interchange formats – Information interchange – Representation of dates and times **{R3}**
- World Wide Web Consortium (W3C) Date and Time Format **{R4}**
- UK Government Data Standards (GovTalk) **{R5}**

The proposed guidance is compliant with the Extended Format of ISO 8601, which displays time as hh:mm:ss. The 'hh' refers to a zero padded hour between 00 and 59, 'mm' refers to a zero padded minute between 00 and 59, and 'ss' refers to a zero-padded second between 00 and 59. In this format, a time may appear as '13:47:30'. The proposed guidance is also compliant with the UK Government Data Standards specification for Time **{R5}**, and the W3C format **{R4}**, which in turn is derived from ISO 8601.

## 2.2 Approximate (or “Fuzzy”) Time

This section presents guidance for the display of approximate times. Approximate (or “fuzzy”) time may be used to indicate an approximation of an exact time. The following is a clinical example where this may occur:

*“A paramedic arrives at a patient’s home at four o’clock in the morning. As part of an acute episode, the patient describes to the paramedic that he woke around two in the morning with pain over his left kidney that lasted five minutes.”*

In this scenario, the user will enter the time '02:00' into the system and should have the opportunity to identify this time as an approximation. The time would be displayed as an approximate time.

Figure 4 illustrates the guidance for the display of approximate times.



Figure 4: Examples of the Recommended Approximate Time Display Format for NHS Clinical Applications

### 2.2.1 Guidance

ID	Guideline	Status
D+Tb-0014	Precede the display of an approximate time value with the word 'Approx'	Mandatory
D+Tb-0015	Display the time value using the guidance for exact time (section 2.1)	Mandatory
D+Tb-0016	Leave a white space between the 'Approx' and the HH element of the time display	Mandatory

Table 5: Guidance – Approximate Time Display

### 2.2.2 Examples of Correct Usage

Usage	Format	Example	Comments
✓	Approx HH:mm	Approx 00:00 Approx 12:00 Approx 03:56 Approx 23:47	Display format for approximate (or “fuzzy”) time

Table 6: Correct Approximate Time Formatting Examples

### 2.2.3 Examples of Incorrect Usage

Usage	Format	Example	Comments
✗	near HH:mm	near 00:00	Failure to use 'Approx' as the preceding text
✗	HH:mm Approx	14:47 Approx	'Approx' should precede the time value

Table 7: Incorrect Approximate Time Formatting Examples

### 2.2.4 Rationale

The primary objective of this guidance is to differentiate between exact and approximate times in a clear and simple manner.

## 2.3 Time Duration

This section presents guidance for the display of time durations, that is, periods of time. The following is a clinical example where the display of time duration may occur:

*“During a consultation, a clinician uses a structured entry form to record the fact that his patient is experiencing absence attacks that last for 30 seconds.”*

In this scenario, after the user has entered the information, the time displayed would be ‘30sec’.

Figure 5 illustrates how time durations will be displayed.

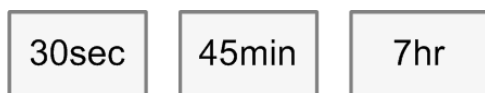


Figure 5: Examples of the Recommended Time Duration Display Format for Clinical Applications

Figure 6 shows additional examples of time duration display, which combine hours, minutes and seconds.



Figure 6: Further Examples of the Recommended Time Duration Display Format for Clinical Applications

A duration display may also represent years, months, weeks and days. To prevent ambiguity between months and minutes, and to improve readability, time units will be displayed in order of decreasing significance with zero-valued units omitted.

Durations may also be approximate, in which case the display of an approximate duration value should be preceded with the word ‘Approx’.

There are a number of contexts where specific display rules may apply (such as displaying a patient’s age), but the precise definition of these rules is beyond the scope of this document.

Figure 7 shows another example of time duration, which is 5 days and 50 minutes.

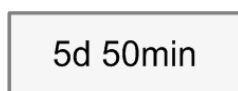


Figure 7: Further Example of the Recommended Time Duration Display Format for Clinical Applications

### 2.3.1 Guidance

ID	Guideline	Status
D+Tb-0017	Display durations using years, months, weeks, days, hours, minutes and seconds, as appropriate	Mandatory
D+Tb-0018	Use whole numbers for time duration, for example, 1, 5, and 60. Do not use decimals or fractions, for example, 0.5, 1.5, 3/4	Mandatory
D+Tb-0033	Ensure that the following minimal set of duration unit abbreviations is supported: <b>y</b> for years, <b>m</b> for months, <b>w</b> for weeks, <b>d</b> for days, <b>hr</b> for hours, <b>min</b> for minutes and <b>sec</b> for seconds	Mandatory
D+Tb-0034	Allow the set of duration unit abbreviations to be extended appropriately, for example, ‘hrs’ as well as ‘hr’. Ensure that any additions are unique within the entire set	Recommended
D+Tb-0026	Omit zero-valued units from the display	Mandatory
D+Tb-0027	Display duration values and their respective units as pairs, with no intervening whitespace between the value and unit	Mandatory
D+Tb-0028	Use a white space as the separator when displaying a duration composed of more than one unit	Mandatory
D+Tb-0029	Display time duration units in decreasing order of significance	Mandatory

ID	Guideline	Status
D+Tb-0030	Precede the display of an approximate duration value with the word 'Approx'	Mandatory
D+Tb-0031	Leave a white space between the 'Approx' and the first element of an approximate duration value	Mandatory

Table 8: Guidance – Time Duration Display

### 2.3.2 Examples of Correct Usage

Usage	Format	Example	Comments
✓	Nnuuu	20sec 10min 15min 55sec 23hr 2hr 40min 4hr 32min 16sec 1m 2d 3hr 17min	Time units should be displayed using three characters to avoid confusion, for example, between minutes and months
✓	Nnu Nnuuu	3d 40min 26w 5d 1m 5d 12hr 26d 5hr 34min 1y 10m 2w 12d 20hr 12min	Display of durations greater than 24 hours

Table 9: Correct Time Duration Formatting Examples

### 2.3.3 Examples of Incorrect Usage

Usage	Format	Example	Comments
✗	N.Nuuu	0.5min 1.5hr 3/4hr	These examples lack clarity; 0.5min could be interpreted as 5 minutes
✗	Nnuuu	15min55sec 2hr90min 4hr32min16sec	The lack of white space separators makes these examples difficult to read
✗	NnuNNuuu	3d40min 26d5hr 1m05d12hr 26d5hr34min	The lack of white space separators makes these examples difficult to read
✗	Nnu Nnu	3d 90m 1m 30m	The use of the same character to indicate months and minutes gives rise to ambiguity

Table 10: Incorrect Time Duration Formatting Examples

### 2.3.4 Rationale

The motivation behind this guidance is to present a standard approach for displaying time durations that is clear, simple and unambiguous. In addition, the guidance allows time durations to be displayed using an appropriate combination of units, for example, 1y 3m 5d, or 5hr 6min 45sec.

Duration values and their respective units are always displayed as pairs, with no intervening white space between the value and unit. This saves space by using fewer characters overall, and the visual grouping helps to reduce the likelihood of values being associated with an incorrect unit.

An alternative approach would be to separate the values and units with whitespace, which is the principle adopted by the guidance for Medications Management **{R6}**. The rationale for this approach is that some letters (such as 's', 'o' and 'i') can be misread as numbers (such as '5', '0' and '1'), so white space separators are used to reduce the likelihood of misreading errors (such as interpreting '12hr' as '121 hours'). However, the likelihood of such errors for time durations is significantly smaller than for medications, since:

- The vocabulary under consideration is much smaller since it consists of just seven duration symbols
- The units are always displayed in a fixed (and familiar) order
- The number of digits used to represent durations is much easier to predict, since hours, minutes and seconds will typically be in the range 0-59, days will be in the range 0-6, months will be in the range 0-11, and so on

For these reasons, the approach of removing whitespace between duration values and units is preferred.

The duration symbols themselves are chosen to be memorable and intuitive, and to minimise the likelihood of misinterpretation. This is particularly important for differentiating months and minutes, as this is the most likely source of confusion (since these units share a common initial letter).

The duration symbol for hours is 'hr' rather than 'hrs' as this can be used to denote both the singular ('1hr') as well as the plural ('2hr'). Conversely, using 'hrs' as the symbol would allow all duration units smaller than a day to be three characters in length (that is, 'hrs', 'min' and 'sec'). This would provide a clear contrast with the remaining symbols, which are all one character in length ('d', 'w', 'm', 'y'). However, the use of a plural ('hrs') would be inconsistent with the other symbols and, for this reason, the adoption of 'hr' is the preferred approach.

Note that this guidance applies to English only; for other cultures different symbols would be appropriate.

## 3 DOCUMENT INFORMATION

### 3.1 Terms and Abbreviations

Abbreviation	Definition
ISO	International Organization for Standardization
IT	Information Technology
W3C	World Wide Web Consortium

Table 11: Terms and Abbreviations

### 3.2 Nomenclature

This section shows how to interpret the different styles used in this document to denote various types of information.

#### 3.2.1 Body Text

Text	Style
Code	Monospace
Script	
Other markup languages	
Interface dialog names	<b>Bold</b>
Field names	
Controls	
Folder names	Title Case
File names	

Table 12: Body Text Styles

#### 3.2.2 Cross References

Reference	Style
Current document – sections	Section number only
Current document – figures/tables	Caption number only
Other project documents	<i>Italics</i> and possibly a footnote
Publicly available documents	<i>Italics</i> with a footnote
External Web-based content	<i>Italics</i> and a <a href="#">hyperlinked footnote</a>

Table 13: Cross Reference Styles

### 3.3 References

Reference	Document	Version
R1.	Design Guidance – Date and Time Input	3.0.0.0
R2.	Design Guidance – Date Display	3.0.0.0
R3.	ISO 8601:2004: Data elements and interchange formats – Information interchange – Representation of dates and times <a href="http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=40874">http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=40874</a>	
R4.	World Wide Web Consortium (W3C) Date and Time <a href="http://www.w3.org/International/O-time">http://www.w3.org/International/O-time</a>	
R5.	UK Government Data Standards (GovTalk) <a href="http://www.govtalk.gov.uk/gdsc/html/noframes/Time-2-0-Release.htm">http://www.govtalk.gov.uk/gdsc/html/noframes/Time-2-0-Release.htm</a>	
R6.	Design Guidance – Medications Management – Medications Views	2.0.0.0

Table 14: References