Functional Design Document for EBM and OA Calculator cum Interpreter

[Evidence Based Medicine and Outcomes Analysis Calculator with Interpreter]

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Introduction

Document Overview

This functional design document records all the functional requirements related to the **evidence based medicine and outcomes analysis calculator cum interpreter**, hereafter called **EBM and OA Calculator cum Interpreter**.

The following chapters will provide the following:

- An overview of the functionality needed within the EBM and OA Calculator cum Interpreter field
- The user requirements with functional and non-functional requirements
- The functional design including use case diagram, activity diagram, sequence diagram, class diagram and the descriptive flow of events
- The business rules
- Glossary
- The version history

User Requirements

Business Process Overview

The length of gestation of a pregnant lady is calculated on the basis of the date of the first day of her last menstrual period to which are added a precise number of days that needs to be adjusted to the average length of her menstrual cycle. Since the calculation is performed on a particular day after conception, it is possible to derive the gestational age of the unborn child as on that day.

Calculation of the expected date of delivery is one of the first tasks that are required to be performed by the attending obstetrician once a pregnancy has been either suspected or, preferably, confirmed. As the mother-to-be is most anxious to learn about all the relevant details of the unborn child and a handy calculator that displays the gestational age of the unborn child according to the last menstrual period (LMP) helps, especially in correlating with the observed gestational age of the child as evident from an ultrasound examination that is usually performed.

Functional Requirements

There is a requirement to be able to calculate the expected date of delivery and the gestational age of the foetus based upon the first day of the last menstrual period and the current server date respectively. The results should display the expected date of delivery in the format – Day, n^{th} day of Month, Year; the entered date of the first day of the last menstrual period date in the format – Day, n^{th} day of Month, Year; the gestational age of the foetus, as on the date, in the format – x weeks and y days; and some pertinent observations, as on the date, regarding what the expectant mother needs to pay attention to in the form of handy tips.

The functionality will accept the date of the last menstrual period in the form of day, month that will be in alphabetical form, and the year. It will also accept the number of days of in a normal menstrual cycle as numbers.

Where the date of the last menstrual period is too far in the past wherein it may be assumed that the pregnancy is more than overdue, or in the future, the application must display the entered date to be a possible wrong date and allow the user the date afresh.

Non-Functional Requirements

1.1.1. Security

No security features are required for this functionality.

1.1.2. Configuration

No user or site configurable items are required for this functionality.

1.1.3. Performance

Provided that the Internet connection has not been lost,

1.1.4. Deployment

No user-specific deployment requirements are present for this functionality.

1.1.5. Prerequisites

Full access to Internet is a prerequisite for this functionality.

1.1.6. Constraints

No constraints exist for this functionality.

Domain Object Model

No domain object model exists for this functionality.

Functional Design

1.1.7. Requirement Analysis

The requirement for this component is to calculate the expected date of delivery and gestational age from the date of the first day of the last menstrual period and the current server date. Then display the results by computing the expected date of delivery and gestational age, as well as some handy tips regarding the expectant mother's condition. If a wrong date is assumed to have been entered by determining whether the date is in the future or too far in the past to allow the pregnancy to have realistically continued, an appropriate message will be displayed.

1.1.8. Use Case Diagram

User (any)

Figure 1.1.8-1 UCD for EBM and OA Calculator and Interpreter
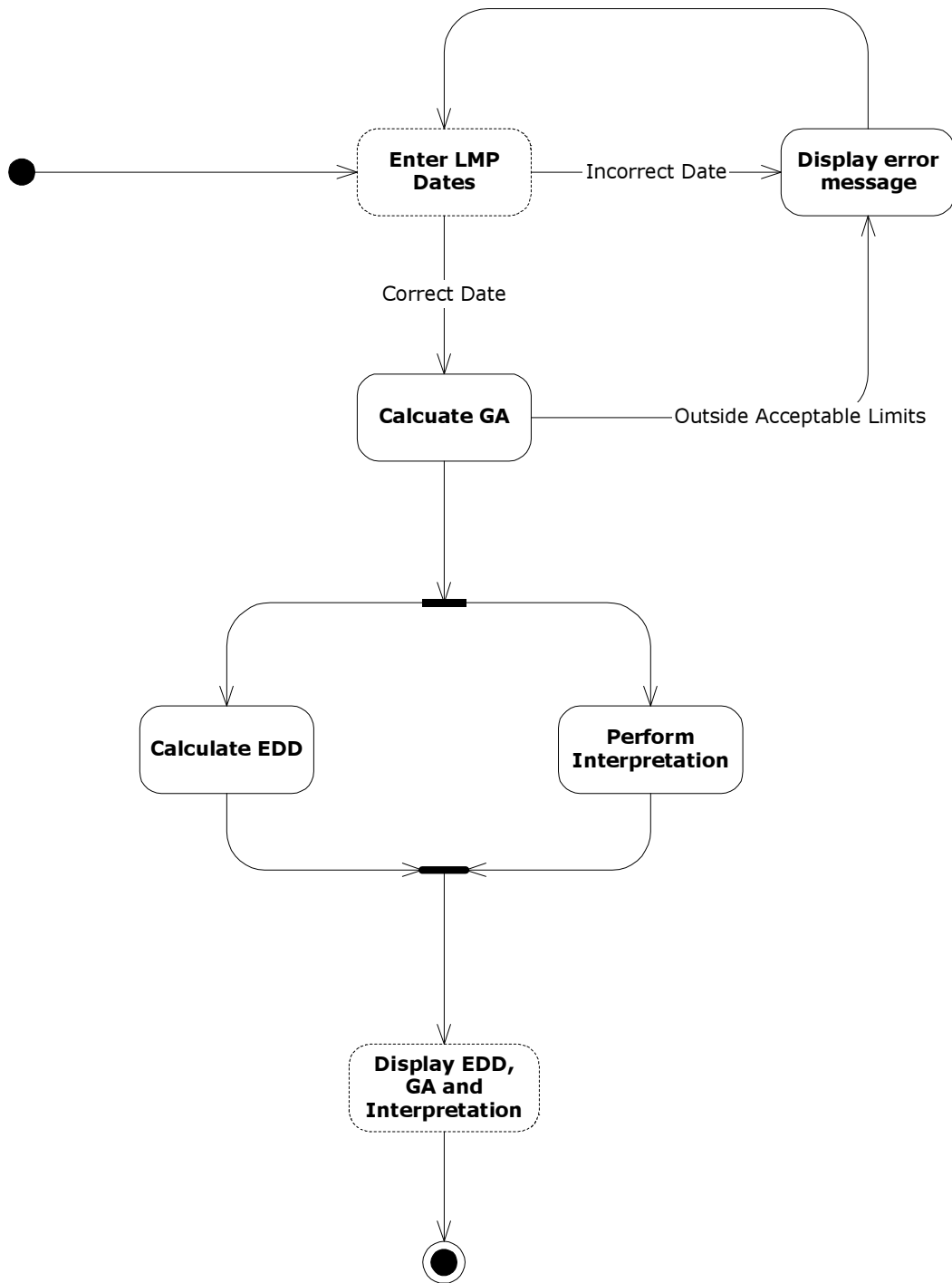
1.1.9. Activity Diagram

Figure 1.1.9-1 Activity Diagram for EBM and OA Calculator cum Interpreter

1.1.10. Flow of Events

The use case starts with the user entering the type and name of data and time span details.

1. Once the component starts, the system will display EBM and Time Span Details User Interface.
2. The title will be displayed as "EBM and OA"
3. The type of data label will be displayed as "Select the type of data to be processed"
4. The type of data form field will be a drop-down list
5. The name of data label will be displayed as "Select the name of data to be processed"
6. The name of data form field will be a drop-down list
7. The start date span label will be displayed as "Select the start date of evaluation period"
8. The start date span form field will be a text box of length 10 and maximum length of 10 with the default display date being current date in the format DD/MM/YYYY. The start date cannot be in the future
9. The end date span label will be displayed as "Select the end date of evaluation period"
10. The end date span form field will be a text box of length 10 and maximum length of 10 with the default display date being current date in the format DD/MM/YYYY. The end date cannot be a date that is less than the start date
11. The start time span label will be displayed as "Select the start time of evaluation period"
12. The start time span form field will be a text box of length 5 and maximum length of 5 with the default display time being the current time in the format HH:MM where the value of HH is between 00 and 23 and the value of MM is between 00 and 59 with single digits displayed with one leading 0. The start time cannot be in the future
13. The end time span label will be displayed as "Select the end time of evaluation period"
14. The end time span form field will be a text box of length 5 and maximum length of 5 with the default display time being the current time in the format HH:MM. The end time cannot be a time that is less than the start time
15. For entering date anywhere in the UI, the following method will be adopted. There will be a clickable ionized button with the picture of a calendar, which on clicking will open a small window displaying the current month of the current year with the current date in highlight. There will be two buttons on the left corner. The inner buttons having the labels made with one lesser than for the left corner and one greater than for the right corner, which on clicking will cause the month to move backward or forward respectively. The outer buttons having the labels made with two lesser than for the left corner and two greater than for the right corner, which on clicking will cause the year to move backward or forward respectively. The dates in the calendar will be clickable and once the user clicks, the clicked date will automatically be inserted in the appropriate date entry field in the parent UI
16. The menstrual cycle length label will be displayed as "Number of days of your normal menstrual cycle"

17. The cycle length will be selected by the user from the drop-down list

18. The submit button will be captioned as "Calculate". On clicking this button once with the mouse, or pressing the Enter key once, the application will perform the required date validation checks.

    a. If the validation fails then the bad date display will be displayed on Bad Date Screen

    b. If the validation passes, then the appropriate calculations will be performed and the results displayed on Results Display Screen

19. The reset button will be captioned as "Clear Form". On clicking this button once with the mouse, or pressing the Enter key once, the application will reset the screen and all entries has to be re-entered by the user

20. The footer will be displayed as "©Sudisa 2004 – 2013"

21. A horizontal line will separate the following information

22. A hyperlink will be displayed as "[Back to Home Page]". On clicking this once the user will be taken to the home page of the application

23. A warning note as in appendix section 4.1 will be displayed

Validation Pass Step

1. If the validation check passes then the calculations based on user inputs will be performed and the results will be displayed Results Display User Interface.

2. The title will be displayed as "EDD and GA"

3. The EDD label will be displayed as "The Expected Date of Delivery (EDD): "

4. The calculated EDD will be displayed in the format – <the day> (as Monday, or Tuesday, etc.), x^{th} of <the month> (January, or February, etc.), <the year> (as 2003, 2004, etc.)

5. The LMP label will be displayed as "The Last Menstrual Period (LMP) Date: "

6. The entered LMP will be displayed in the format – <the day> (as Monday, or Tuesday, etc.), XXth of <the month> (January, or February, etc.), <the year> (as 2003, 2004, etc.)

7. The gestational age label will be displayed as "The gestational age of the foetus (as of today): "

8. The calculated gestational age will be displayed in the format – X weeks and Y days. If the number of weeks is 1, then it will be displayed as 1 week, and if the number of days is 1, then it will be displayed as 1 day

9. The handy tips label will be displayed as "Other observations (as of today): "

10. The appropriate handy tips will be displayed as a legend, the details of which are in appendix section 5.4

11. The footer will be displayed as "©Sudisa 2004 – 2013"

12. The submit button will be captioned as "Repeat". On clicking this button once with the mouse, or pressing the Enter key once, the user will be redirected to the enter LMP and cycle length details screen

13. A horizontal line will separate the following information

14. There will be a hyperlink "[Back to Home Page]". On clicking this once the user will be taken to the home page of the application

15. The warning note as in appendix section 4.1 will be displayed

Validation Fail Step

1. If the validation check fails then the Bad LMP Date User Interface will be displayed
2. The title of the screen will be displayed as "EDD and GA"
3. The legend below will be displayed as "Possible wrong LMP Date"
4. The title will be displayed as "EDD and GA"
5. The last menstrual period label will be displayed as "Select the start date of your last menstrual period"
6. The date will be composed as follows. The user will select from the appropriate drop-down lists the day, the month and the year. Due to the variations in the way dates are entered by various users from across the globe, the first number will represent the day, the month name will indicate the month, and the year number the year. The application will form the date in the appropriate format for further manipulation.
7. The menstrual cycle length label will be displayed as "Number of days of your normal menstrual cycle"
8. The cycle length will be selected by the user from the drop-down list
24. The submit button will be captioned as "Calculate". On clicking this button once with the mouse, or pressing the Enter key once, the application will perform the required date validation checks.
    a. If the validation fails then the bad date display will be displayed on Bad Date Screen,
    b. If the validation passes, then the appropriate calculations will be performed and the results displayed on Results Display Screen
9. The reset button will be captioned as "Clear Form". On clicking this button once with the mouse, or pressing the Enter key once, the application will reset the screen
10. The footer will be displayed as "©Sudisa 2004 – 2013"
11. A horizontal line will separate the following information
12. There will be a hyperlink "[Back to Home Page]". On clicking this once the user will be taken to the home page of the application
13. The warning note as in appendix section 4.1 will be displayed

1.1.11. Control Behavior Table

LMP and Cycle Length Details

Name	Type	List Values	Default Value	Tab Order	Validation Behaviour	Mandatory Control?
Title	Label	NA	EDD and GA	1	NA	NA
LMP Date	Label	NA	Select the start date of your last menstrual period	2	NA	NA
Day	Drop-down List	01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19	01	3	Numerical Data Type	Yes

		20 21 22 23 24 25 26 27 28 29 30 31				
Month	Drop-down List	January February March April May June July August September October November December	January	4	Alphanumeric data type	Yes
Year	Drop-down List	2003 2004	2003	5	Numeric data type	Yes

		2005 2006 2007 2008 2009 2010 2011 2012					
Cycle Length	Label	NA	Number of days of your normal menstrual cycle	6	NA	NA
Cycle Length	Drop-down List	15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30	28	7	Numeric data type	Yes

		31 32 33 34 35 36 37 38 39 40				
Calculate	Submit Button	NA	Calculate	8	NA	Yes
Clear	Reset Button	NA	Clear Form	9	NA	Yes
Footer	Label	NA	©Sudisa 2004 – 2013	10	NA	NA
Separator	Horizontal Line	NA	NA	11	NA	NA
Home page Link	Hyperlink	NA	[Back to Home Page]	12	NA	Yes
Email Link	Email Link	NA	The word "email" in line 6 of section 4.1 will be linked to "mailto:sbbhattacharyya@lycos.co.uk?subject =Issues regarding EDD and GAge calculations"	14	NA	Yes

Results Display

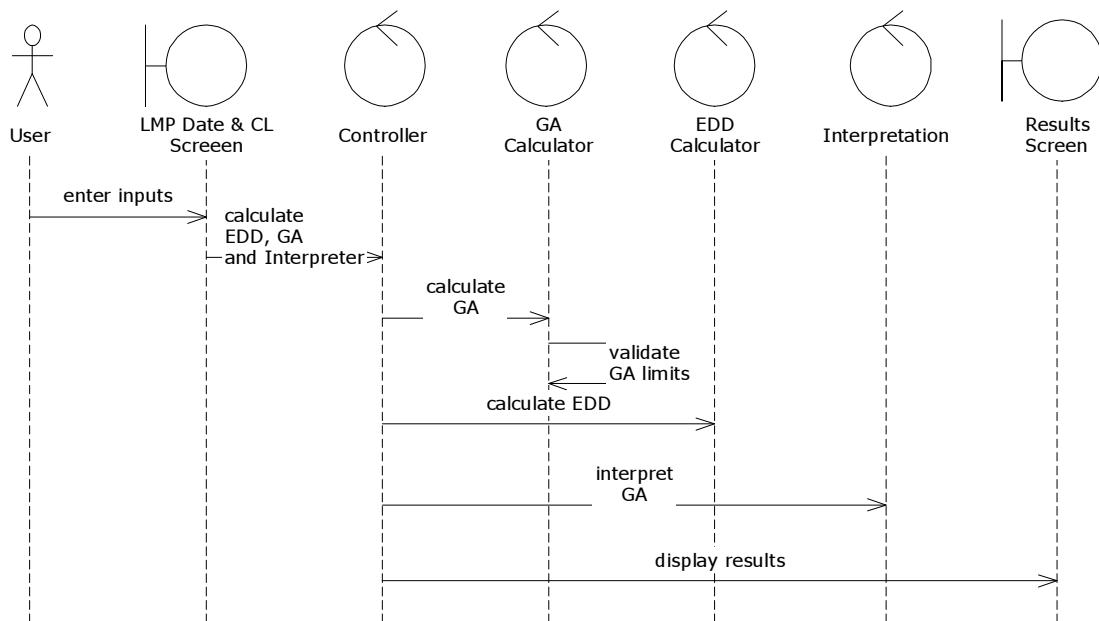| Name	Type	List Values	Default Value	Tab Order	Validation Behaviour	Mandatory Control?
Title	Label	NA	EDD and GA	1	NA	NA
EDD Label	Label	NA	The Expected Date of Delivery (EDD):	2	NA	NA
EDD Display	Label	NA	\<the day\>, XXth of \<the month\>, YYYY	3	NA	NA
LMP Label	Label	NA	The Last Menstrual Period (LMP) Date:	4	NA	NA
LMP Display	Label	NA	\<the day\>, XXth of \<the month\>, YYYY	5	NA	NA
GA Label	Label	NA	The gestational age of the foetus (as of today):	6	NA	NA
GA Display	Label	NA	X weeks, and Y days *(1 week or 1 day when these values are equal to 1)*	7	NA	NA
Handy Tips Label	Label	NA	Other the observations (as of today):	8	NA	NA
Handy Tips Display	Label	NA	*See section 3.1.5 – to be displayed as per the calculations*	9	NA	NA
Footer	Label	NA	©Sudisa 2004 – 2013	10	NA	NA
Submit	Button	NA	Repeat	11	NA	Yes
Separator	Horizontal Line	NA	NA	12	NA	NA
Home page Link	Hyperlink	NA	[Back to Home Page]	13	NA	Yes
Email Link	Email Link	NA	The word "email" in line 6 of section 4.1 will be linked to "mailto:sbbhattacharyya@lycos.co.uk?subject=Issues regarding EDD and GAge calculations"	14	NA	Yes

1.1.12.Sequence Diagram

Figure 1.1.12-1 Sequence Diagram for EDD and GA Calculator cum Interpreter; Basic Flow
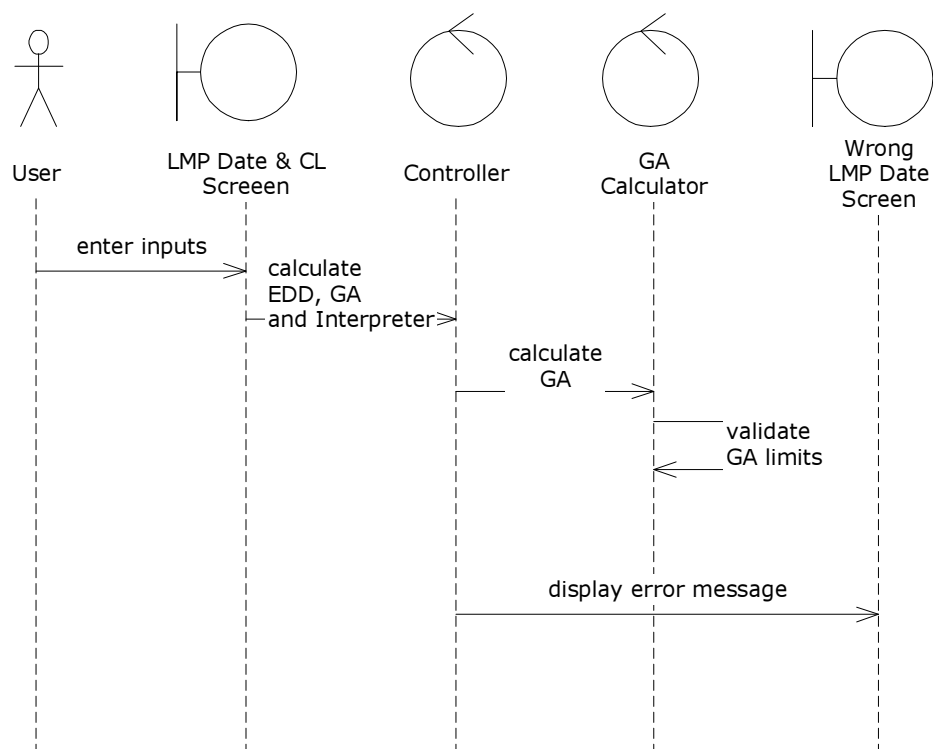

Figure 1.1.12-2 Sequence Diagram for EDD and GA Calculator cum Interpreter; Alternate Flow: Possible Wrong LMP Date
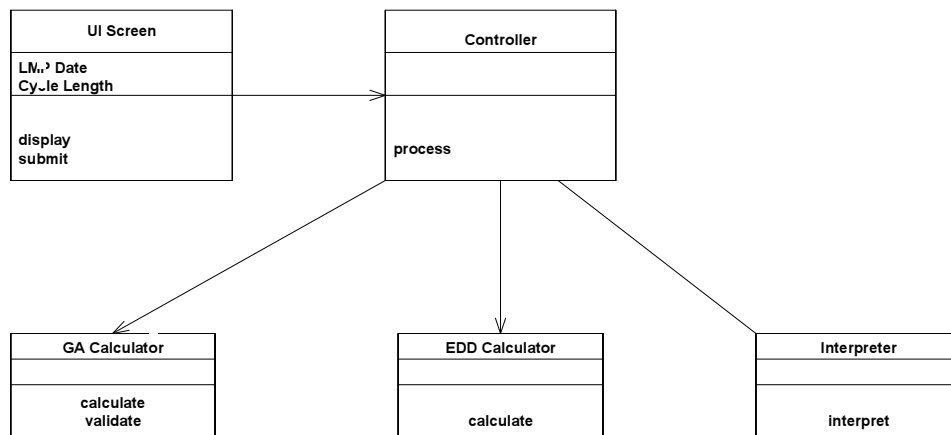
1.1.13.Class Diagram

Figure 1.1.12-3 Class Diagram for EDD and GA Calculator cum Interpreter

1.1.14.Help

No help exists for this functionality.

1.1.15.Properties

The user interfaces should be displayed within 5 seconds over a true 56 kbps Internet connection.

1.1.16.Inputs

1.1.16.1.Mandatory Inputs

There are no mandatory inputs for this functionality.

1.1.16.2.Optional Inputs

There are no optional inputs for this functionality.

1.1.17.Configuration

The default configuration cannot be changed by any user at any point of time.

1.1.17.1.Default Configuration

The default configuration is "as-is" as depicted in the User Interfaces given above.

1.1.18.Site Configurable Data Items

There are no site configurable data items for this functionality.

1.1.19.Dependencies

No dependencies exist for this functionality.

1.1.20.Pre-conditions

- Connection to Internet has been established
- Permissions to visit health web-sites set
- User has the necessary permission to be able to visit and interact with health web-sites
- Web-browser has been opened

- Web-browser is Mozilla 1.5 or above, or Firefox 0.6 or above, or Netscape 6 or above, or MS Internet Explorer 5.5 or above
- The correct URL has been entered

1.1.21.Post-Conditions

No post-conditions exist for this functionality.

1.1.22.Invariants

No invariants exist for this functionality.

Business Rules

1.1.22.1.Method for Calculating Expected Date of Delivery

Where the normal menstrual cycle length is equal to 28 days:

Expected Date of Delivery = Last Menstrual Period + 281

Where the normal menstrual cycle length more than 28 days:

Expected Date of Delivery = Last Menstrual Period + (Cycle Length – 28) + 281

Where the normal menstrual cycle length less than 28 days:

Expected Date of Delivery = Last Menstrual Period + (28 – Cycle Length) + 281

1.1.22.2.Method for Calculating Gestational Age

Gestational Age (in days) = Last Menstrual Period – Date Today

1.1.22.3.Handy tips and Associated Rules

When the gestational age is between 0 and 4 weeks:

Has the pregnancy been confirmed yet?

If yes, start being careful.

If no, have it done right away...

When the gestational age is between 5 and 9 weeks:

The baby's major organs have started to form.

The greatest risk of birth defects is now.

So please be ultra-careful regarding your lifestyle

When the gestational age is between 10 and 23 weeks:

The baby's major organs should have been fully formed by now.

Your chances of miscarriage are less now.

When the gestational age is between 24 and 26 weeks:

Ideally your baby should survive even if born right away, but will most probably require neonatal ICU care.

When the gestational age is between 27 and 32 weeks:

You should eat properly to allow your baby to get the maximum nutrition possible.

When the gestational age is between 33 and 36 weeks:

You can go into labour. So be prepared.

When the gestational age is between 37 and 40 weeks:

You can delivery anytime now.

When the gestational age is more than 40 weeks:

You should have delivered by now.

See your obstetrician immediately.

N. B. When the gestational age is more than 42 weeks no tips should be displayed. Instead the application should display a bad LMP date display as the date entered is most likely to be wrong.

1.1.22.4.User Rights

All users will have equal rights and will be able to access this functionality at all times.

Appendix

Warning Sign

As this functionality will be available over the Internet and hence anyone may access and use it, a warning sign for the user is required to be placed for the purposes of denying any liabilities of any kind. The words will be in Verdana font sized small.

Please note that this is a free site and the information provided is for free
The information has been sourced from well-known books on the subject
However, your physician is the best and the ultimate authority and must be consulted at all times for clarifications
I accept no liability either implicit or explicit whatsoever.
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Glossary

Term	Explanation
Expected Date of Delivery	The date on which the unborn child is expected to be born
Last Menstrual Period	The last periodical menstrual bleeding that occurred before the particular encounter with the observer who usually is a care provider. With regards to pregnancy and child-birth, this usually refers to the menstrual period that occurred immediately prior to the cessation of menstruation
Gestational Age	Refers to the age of the fetus in the womb. Has clinical significance regarding its ability to survive if born right away, genetic or birth defects, weight, overall condition, etc.
Normal Menstrual Cycle Length	The number of days that usually elapse between one menstrual period and the next, provided that the lady has not suffered from any health-related episode that disrupted the cycle like it being caused due to some illness or as a consequence of medication
Care Provider	Any professional who provides care to a patient and is professionally responsible for the same. They may be a medical doctor, registered nurse, dentist, orthodontist, physiotherapist, optometrist, etc.

Version History

Date	Version	Details	Author
04 August 2004	0.9	First version of functional design document for calculation of expected date of delivery and gestational age	Dr. SB Bhattacharyya
05 August 2004	1.0	Incorporated formatting changes, added glossary, corrected typographical errors, and re-drawn the Use Case Diagram using MS Visio	Dr. SB Bhattacharyya
12 August 2004	1.5	Added activity, sequence and class diagrams using MS Visio, re-arranged topics for improved document flow and renamed the document to Use Case from Functional Design	Dr. SB Bhattacharyya
17 August 2004	1.6	Corrected errors in the use case and sequence diagrams and renamed the document back to Functional Design from Use Case	Dr. SB Bhattacharyya
18 August 2004	1.7	Corrected a small error in the sequence diagrams	Dr. SB Bhattacharyya
26 August 2004	1.8	Filled in information regarding domain object model	Dr. SB Bhattacharyya