ICM+ Standard of Procedures



GE Carescape monitors

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http://www.neurosurg.cam.ac.uk/icmplus

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Prerequisites

- 1. A laptop (or a PC) with the latest ICM+ and its GE Datex-Ohmeda/Carescape module installed
- 2. Carescape or Datex-Ohmeda monitor.
- 3. **Appropriate cables** a serial null-modem cable connecting the serial port on Datex-Ohmeda monitors with the serial (RS232) port on the laptop with ICM+ must be prepared according to the Appendix 6.
- 4. Serial port available in the laptop If no serial port is available on the laptop an appropriate USB-Serial adapter must be used (eg ATEN UC232A, http://www.aten.com/global/en/products/usb-&-thunderbolt/usb-converters/uc232a/). Please note that this adapter must also be used with Carescape monitors.
- 5. Optional file server, for archiving the data.

Locking and unlocking ICM+

ICM+ includes a simple system of user based permissions, which allows it to be used safely in a clinical environment, also by people with minimal training, ensuring that the vital data collection process is not inadvertently interrupted or disturbed.

If your ICM+ is correctly configured when the program is run it will automatically initialize with the default user 'Nurse'. There are three other users already configured in ICM+, the Administrator, the Manager and the Operator. The users have been configured with progressively decreasing operational rights.

The **Nurse** is the user with the fewest rights in the software, effectively only being able to insert clinical events, browse the charts and starting new sessions, without any possibility to disrupt the data collection procedure. Please refer to the 'How to use the events form' for more details. After 3 minutes of inactivity, ICM+ automatically logs in as a Nurse.

The **Administrator** is the user that will have full access to the full features of the application.

The **Manager** will have the same privileges but will not be able to manage user accounts.

The **Operator** will only be capable of starting new Recording sessions with available profiles, browsing data, inserting clinical information and display configuration.

Login (change users) form is accessible via a button on the tool bar/main menu bar.



When the Login button is pressed, the User login form will appear.



In this form you will find:

1. A button to the Default user and a button to lock the application so that nothing but the login button is accessible.

2. A key pad to insert the Password for a given use.

3. And a Drop-Down menu to select the user to Login as

GE Datex-Ohmeda/Carescape monitor data collection ICM+ SOP

Starting a new data collection session



To create a new data acquisition session hit New Patient button.

This will bring up a new form:

rioject.	Traumatic Brain Injury						
Data File:	C:\Users\peter\Doc	uments\ICM+\Data\TBI_20170914205	547_HEX.icmp				
-Patient's i	nformation						
First Na	me	Middle Initial	Date Of Birth	14/09/2017 🔲 🔻	00:00		
Surnam	e		Date Of Ictus	14/09/2017	00:00		
Hospita	IID		Date Of Admission	14/09/2017 💷 🗸	00:00 🚖		
Room/B	ed No		Gender	🖲 Male 💿 Fe	emale		
Anonym	ised ID						
Clinical	background						
Clinical	background						
Clinical	background etrieve Demog	raphics From					
Clinical R Data Acqu	background etrieve Demog uisition/Analysis C	raphics From			v		
Clinical R Data Acqu C:\\CI	background etrieve Demog Jisition/Analysis C ENTER-TBI/CT	raphics From onfiguration Profile BL_Carescape.icmc					
Clinical R Data Acqu C:\\CI Custom	background etrieve Demog uisition/Analysis C ENTER-TBI\CT ise the profile	praphics From onfiguration Profile TBI_Carescape.icmc Clear All	als Sources	Line Analysis	Clear History		

More importantly a data acquisition/analysis profile (configuration) file should be selected, either from the history list box or loaded from the file system. These can then be modified if necessary using Signal Sources editor (describe below), and/or On Line Analysis editor.

After the OK button is clicked, the Devices check dialogue is presented.

Devices check			×
Please check the c	onnections before continuing:		
Device	Connection	Test	Enabled
Carescape	COM1	 ✓ 	Yes
🗸 ок 🗶	Cancel	ate Ports	Skip

This dialogue is used to test the communication between the ICM+ and the monitor (the 'Test connections' button). If the test is successful the OK button can be pressed.

This form can also be used to modify the connection port (if it is a serial connection) or an IP address (in case of a network interface). For serial connections, the button 'Auto allocate ports' can be used to initiate the process of scanning and testing all the available ports for automatic port allocation.

Just before the session starts, the user is prompted to insert some additional information about the patient, if configured, via the Project Specific data dialogue. This form is also accessible from the Patient Notebook tab but it is highly recommended that it is filled in, as much as possible and practical to do, at the start of the session.

Project sp	ecific data	×
GCS CT Marshall score Type of TBI	5 IV Diffuse brain injury	> >
Politrauma	Abdominal	~
🗸 OK 🗶 Cancel 🛞 K	eyboard	

After this dialogue, ICM+ main display is presented and the session begins recording automatically, if this behaviour is configured in the used project. Otherwise use Start button to start data acquisition (see below). The charts with configured calculated parameters will get updated with the rate specified in the configuration profile. In order to see the raw data as it comes in from the monitor(s) click on the Signal Monitor tab, or the Monitor button is the tab is not available yet (see below).

Home Charlts Data Tools	🔊 🥒 🦻 🐘 🔝	
& Series Clinical Notebook 😨 Signal Monitor		
ABP 55 84.2 70 CPP 55		
81.2 m		
ICP 50 3.0 (0) 10 10 10 10 10 10 10 10 10 10 10 10 10		
PRx 0.5		
PRx 8/3 12.30	8/3 12:45 8/3 13:00 8/3 13:15 Time scale: <2 hours > 08/03/2017 12:15:02 - 14:1	8/3 13.30 8/3 13.45 8/3 14.00 8/3 14.
☑ ½ · △ ₩ I ■ ·		

Data analysis, main, display (as configured in the loaded profile). The charts can be modified using Charts top menu tools.



The raw signal monitor, showing all the data as it comes in. Please note that the raw data is stored in a separate file (or files if the one grows too large) with the name shown at the bottom of the monitor signals panel (file extension *.dta).

If ICM+ **shuts down during a recording session** the next time it is run, the previous session is automatically restored, but here the user must first verify that all the signals are being received correctly in the Monitor button. After this the Start button must be pressed and the session resumes recording.



Manually configuring data collection

If there is no prepared profile available that includes desired data collection from the monitor or if there is a need to modify or add parameters downloaded from the monitor Signal Sources option needs to be used. This can be done in the New Data Acquisition Form:

Customise the profile	Clear All	Signals Sources	🔀 On Line Analysis
✓ ОК	X Cancel	ॐ On Screen Key⊾	

Or using Signals button in the main Menu (Data Section), with the data acquisition in pause mode.

			ICM	1+ - CTBI_CAM_20161223145142_HEX.id	mp	
	Home Charts Dat	a Tools				
8	ک 🖌 ک	Σ 🔊		STOP STOP	1	
Logi	n Minimise Signals Ca Ribbon	culations Connections Check	Save Load Profile Profile	Start Stop Monitor Data Snapshot	New New Event Note	
	Analys	sis Configuration	Profile	Control Panel	Annotations	

This brings up the Sampler Configuration form:

🙊 Sampler Configura	ation Dialog					- 0 x
Digital output devices	Analogue output devices	RS232 ASCII streamin	g devices			
Name	Туре	Port	Baud	Sampi Frq	Enabled	
译 <u>M</u> odify	+ <u>A</u> dd □	elete	r			
Name	Units Device	Waveform M	in V Ma	x Enabled		

Clicking on Add button in the upper part (Digital Output devices tab) opens a Device Configuration dialog. Here, one can select the monitor module from the list of available (installed) interfaces, as well as specify the serial port (real or virtual, when using USB-RS232 adapter) and its baud rate to match the one configured/offered by the device.

ligital Outpu	It Device Configuratio	n Dialog	
Device Name:	CARESCAPE	Device Type:	CARESCAPE
			BIS Camino Capnostream CARESCAPE CerOx CNSMonitor Dash DatexS5
 Interface type RS232 	COM Port: Baud Rate: Address:	COM1 • 19200 •	Sampl. Freq. 300.00 (Enabled: V Communication Test
🗸 ок	X Cancel	ॐ Keyboard	

When the correct interface module, the COM port and the baud rate is chosen, clicking on 'Communication Test' will try to establish communication with the monitor and the log of that communication is printed in the memo box, listing also all the parameters that are available to download from the monitor.

ligital Output I	Device Configuration	n Dialog		
Device Name:	CARESCAPE	Device Type:	CARESCAPE	
Available waves/n wvECG.ll,wvECG. P.SYS,ICP.DIA,ICP Wave values recei Available waves/n wvECG.ll,wvECG. P.SYS,ICP.DIA,ICP Connection close	umerics list: V,wVECG.AVL,wVRE MEAN,ICP.HR,Ttym ived umerics list: V,wVECG.AVL,wVRE MEAN,ICP.HR,Ttym d	SP,wvART,wvICP,I p,Tcore SP,wvART,wvICP,I p,Tcore	HR,ST1,ST2,ST3,IMP_RR,ART.SYS,ART.DIA,ART.MEAN,ART.HR,IC	•
Interface type	COM Port: Baud Rate: Address:	COM1 ▼ 19200 ▼	Sampl. Freq. 300.00 🗭 Enabled: 🔽	
• ок	X Cancel	≫ Keyboard		

When the connectivity is confirmed the dialog can now be closed, which causes the device to be added to the data collection configuration. What remains to complete the configuration is adding to the configuration all the desired parameters to be downloaded. This can be achieved by using the Add button in the lower part of the Sampler Configuration dialog.

giai capat devices	Analogue output devices	RS232 ASCII streaming d	evices		
Name	Туре	Port Ba	ud Sampl Frq	Enabled	
Intellivue	Intellivue	COM2 11	5200 250.00	Y	
Name	Units Device	Waveform Min V	(Max Enabled		
	1				
Modify	+ <u>A</u> dd	elete			

This opens a signal selection dialog:

Digital Output Device Signals S	Selection Dialog
Device : Carescape 🗸	Preview
Signal Name :	
Signal Units :	
Waveform :	
Enabled 🗸	
Physiological Values Range	
Min Value : 0	
Max Value : 300	Start Stop
V OK X Cancel	E Keyboard

Using the little '...' button one can select available signal, one at a time.

Digital Output Device Signal	s Selection Dialog	
	Signal selection dialog	
Device : Carescape	List of available signals	
Signal Name :	wvECG.II wvECG.V	
Signal Units :	wvECG.AVL wvRFSP	
Waveform :	WVART	
Enabled 🔽	ST1 ST2	
Physiological Values Range	ST3	
Min Value : 0	MP_RR ART.SYS	
Max Value : 300	Refresh the list	Stop
✓ OK X Cancel	OK X Cancel	

When a parameter is selected one can test if the data is coming in as expected by using the Start button

Digital Output Device Signals Select Device : Carescape Signal Name : abp Signal Units : mmHg Waveform : wvART Enabled	tion Dialog
Physiological Values Range Min Value : 0 Max Value : 300	Contraction of the second seco

This process can be repeated as many times as it is needed putting together the complete list of parameters to be collected, which complete the data acquisition configuration procedure.

igital output devices	Analogue o	output devices R	S232 ASCII strea	aming devic	es			
Configured devices v	with propriet	ary digital output p	rotocols					
Name	Туре	Po	ort	Baud .	. Sampl	Frq	Enabled	
Carescape	DatexS	5 C(DM1	19200	300.0	D	Y	
Modify		I <u>D</u> ele	ete 🕅 C	ilea <u>r</u>				
Name	units	Device	Waveform	Min V	Max	Enabled		
abp	mmHg	Carescape	wvART	0	300	Y		
icp	mmHg	Carescape	WVICP	-30	150	Y		
ecg	uV	Carescape	wvECG.II	-200	200	Y		
EtCO2		Carescape	EtCO2	0	100	Y		
Temp	Grad	Carescape	Tcore	0	50	Y		
SpO2	%	Carescape	SpO2	0	100	Υ		
	+ <u>A</u> dd	I <u>D</u> ele	ete 💁 c	ilear			(On track of the	

Please note, that adding parameters/signals to the data collection will make ICM+ show and record the data through the Signal Monitor window but the trends charts will not automatically get configured to show them. This is because the trend charts only show results of calculations, not the raw data. So to display even just a mean trend of a newly added variable collected from the monitor ICM+ this needs to be configured first in the analysis section, as in picture below, and then the new trend added to the charts.

NameFormulaSampling FrqMinMaxDigital FilterEnabledABPabp2500300NoneYICPicp250-30100NoneYECGecg25000NoneYSp02spo2100NoneYTemptemp100NoneYETC02etco2100NoneY		Primary Analysis Seconda	ry Analysis 1 Se	econdary Analysis 2	Final Analysis		
ABP abp 250 0 300 None Y ICP icp 250 -30 100 None Y ECG ecg 250 0 0 None Y Sp02 spo2 1 0 0 None Y Temp temp 1 0 0 None Y ETCO2 etco2 1 0 0 None Y	Name	Formula	Sampling	Frq Min	Max	Digital Filter	Enabled
ICP icp 250 -30 100 None Y ECG ecg 250 0 0 None Y Sp02 spo2 1 0 0 None Y Temp temp 1 0 0 None Y ETC02 etco2 1 0 0 None Y	ABP	abp	250	0	300	None	Y
ECG ecg 250 0 0 None Y Sp02 spo2 1 0 0 None Y Temp temp 1 0 0 None Y ETCO2 etco2 1 0 0 None Y	ICP	icp	250	-30	100	None	Y
Sp02 spo2 1 0 0 None Y Temp temp 1 0 0 None Y ETC02 etco2 1 0 0 None Y	ECG	ecg	250	0	0	None	Y
Temp temp 1 0 0 None Y ETC02 etco2 1 0 0 None Y	SpO2	spo2	1	0	0	None	Y
ETCO2 etco2 1 0 0 None Y	Temp	temp	1	0	0	None	Y
	ETCO2	etco2	1	0	0	None	Y
Modify + Add - Delete Clear Auto Fill Default Fs [Hz]: 250.0 C		fy + Add -	- <u>D</u> elete	Clea <u>r</u> A	uto <u>F</u> ill Default Fs [H	z]: 250.0 💌	

Annotating clinical events

As soon as the acquisition of data starts the main menu tool bar will get minimised and in its place a small, 'data acquisition essentials', tool bar will open, as below.



There, from left to right the following functions are accessible:

- 1. Log-in/Log-off form to change the user (ie privileges)
- 2. Event annotation form
- 3. Free textual annotations form
- 4. An on-screen keyboard
- 5. The last button closes this tool bar and unfolds the main men toolbars

Terminating the data collection session and uploading the data

When the data acquisition process is finished the recording session can be closed using the Close button present in the ICM+ button. This will initialize a cascade of forms that will eventually lead to the sealing of the file and subsequent archiving the data to the file server, if required.

Closing a session is different from closing the program. To close the ICM+ application you need to press the red cross present on the upside corner of the right side of the screen. If ICM+ is closed (Exited) using this button or if the computer shuts down, the next time it is run, the recording session will be resumed with the same configurations it had at the moment of shutdown.



When this button is pressed a dialogue is presented prompting the user to confirm the closure of the recording session:



After confirming the end of the recording session another dialogue is presented prompting the user to archive the data:



After confirming this dialogue the Data Archiving Form is presented, where the user can specify/confirm the location of the server and its share to use:

🙊 Data archiving configura	tion form	
Use settings from the projec	t: Devel 🔹	
Data storage details		
Data Archive Folder		
//srv1/backup		1
Create New Subfold	ler 🛛 Use original file name for the subfolder	
devel_CAM_20161103	212242_HEX	
☑ Create info text file		
Operation		
🔘 Сору	Move	
🗸 ок 🛛 🗶 Саг	Remember Selection	

If a session was for some reason closed and a recording needs to be restored again the button open can be pressed.



The dialog that opens can be used to reopen the file in order to upload the data to our servers or to restore the recording session.

😪 File Open Dial	log				×
Type 🜉 🔯 🍸 ICM+ main data file 🗸 🎉 C:\Users\Manuel\Documents\ICM+\Da	ata			~	35
Browse for File					
Mane Mane	Size 40 KB 30 KB 25 KB 73 KB 73 KB 73 KB 74 KB 179 KB	Item type ICM+ data file ICM+ data file	Date modified 0701/2015 00/28:47 0601/2015 00/28:47 2711/2014 124:02 2711/2014 18:00 022 1911/2014 18:00 022 1911/2014 18:00 022 1911/2014 02:47 10111/2014 09:47:30		
C:\users\Waquel\Documents\ICM+\Data\CTBL_20150106153922_MANUELPC.icmn					
Events, Size: 4706 Notebook, Size: 0 GeneralInd, Size: 386 GinicaData, Size: 2 PatientDescr, Size: 780 Pawneral					^
Name= Nidfinital= Surname= HospitalNo= DateOfBithoE/01/2015 Sex=Male Ø Open new window	L Restart recording	2 📀	ancel		

To reopen a file for inspection or to upload it is only necessary to double-click the desired file.

To restore the recording session, the highlighted button must be pressed and the recording resumes using the same profile as when it was closed.

Exporting data to a csv (Excel) format

There are two ways the data can be exported from ICM+. One way is to select Export option in the main menu (the Brain icon).



This will export all the trend data from the memory, all the variables, in commas separated columns of values, with the first column containing the time stamps, in the internal Windows DateTime format. The DateTime format is essentially a number of days (and their fraction, which translate into time) since 31/12/1899. Imported into Excel it will initially showed up as those numbers, but if date or time (or combined) cell formatting is requested for that column the data and or time will be shown.

ĺ	Format Cells	
	Number Alignment Font Border Fill Protection	
Ela one locat Doel word Formular	General Sample	Image: Second
Calibri · 11 · = = = = = = :	Currency Accounting Date Date Date	$\begin{array}{c c c c c c c c c c c c c c c c c c c $
Clipboard G Font G Alignment G	Time dd/mmyyyy minimiss Percentage Adversery dd/mmm.yyy	Clipboard is Font is Algenerit is Number is Cells Editing
A B C D 1 DateTime ICP[mmH_AMP[mmHHR[1/min R	Scientific mmm-yy Text h:mm AM/PM Special h:mm:ss AM/PM	A B C D E F G H I 1 DateTime ICP[mmH; AMP[mmi HR[1/min, BR[1/min] RAP]] RA[mmHg ICPmax[m ICPmin]m Slr
2 42486.41416 -2.411 0.0072 172.6 3 42486.41427 -2.378 0.0274 82.6	Custom hh:mm hh:mm:ss dd/mm/yyyy hh:mm	2 26/04/2016 09:56:23 -2.411 0.0072 172.6 3.742 0.0252 -2.833 -2.453 3 26/04/2016 09:56:33 -2.378 0.0274 82.6 4.556 0.07 -2.823 -2.425 4 26/04/2016 09:56:33 -2.578 0.0274 82.6 4.556 0.07 -2.823 -2.425 4 26/04/2016 09:56:33 -2.678 0.01 7.07 4.716 0.4811 0.1393 -2.492 -2.843
4 42486.41439 -2.673 0.01 70.07 5 42486.4145 -2.995 0.0143 6 42486.41462 -3.152 0.0072	mm:ss mm:ss.0 @	5 26/04/2016 09:56:53 -2.995 0.0143 54.28 0.2496 -2.876 -3.086 6 26/04/2016 09:57:03 -3.152 0.0072 52.98 4.073 0.4408 0.0557 -3.103 -3.209
7 42486.41473 -3.248 0.0073 106.3	v	7 26/04/2016 09:57:13 -3.248 0.0073 106.3 23.12 0.5201 0.0091 -3.223 -3.276 8 26/04/2016 09:57:23 -3.287 0.0052 169.9 21.32 0.5927 0.0049 -3.261 -3.301 9 26/04/2016 09:57:23 -3.287 0.0052 169.9 21.32 0.5927 0.0049 -3.261 -3.301 9 26/04/2016 09:57:23 -3.287 0.0052 169.9 21.32 0.5927 0.0049 -3.261 -3.301
2 42480.4457 -5.302 0.0063 89.36 10 42486.41508 -3.316 0.0074 71.62 11 42486.4152 -3.319 0.0087 77.56	Type the number format code, using one of the existing codes as a starting p	10 26/04/2016 09:57:53 -3.316 0.0074 71.62 25.06 0.6319 0.0044 -3.326 -3.324 11 26/04/2016 09:57:53 -3.319 0.0087 77.56 6.27 0.6254 0.0103 -3.305 -3.331
12 42486.41531 -3.331 0.0078 81.54 13 42486.41543 -3.341 0.0098 97.98 I + + H test r1 92		12 26/04/2016 09:58:03 -3.331 0.0078 81.54 15.79 0.6287 0.0072 -3.319 -3.348 13 26/04/2016 09:58:13 -3.341 0.0098 97.98 16.77 0.612 0.0052 -3.328 -3.345
Ready Average: 42487.78801 Count: 23417 Sun	ОК	Kesdy Average: 27,04/2016 18:54:44 Count: 23417 III III III III III IIII IIIIIIIIIIII

The second way of exporting data is to use the data export chart tool, located at the bottom of each charting vertical panel:



This will export data only from the variables plotted in the panel corresponding to the button toolbar, in this case it will be ICPsys, ICPdia, ICP and ICPpulse only, and only from selected time periods, if the selection tool is used, or the whole recording time, if not.

	9 • (2 •	Ŧ	DLPatient0000	36_r1.csv - Micros	oft Excel	-		×
	File Home	Insert Page La	yout Formulas	Data Rev	iew View		ے 🕥 ۵	æ X
	Calib	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$		General ▼ ▼ ♥ ▼ % ,	Age Break Styles Break	Σ -	Sort & Find &	
с	ipboard 5	Font G	Alignment	S Number S	Cells	-	Editing	
	115	• (°	f _x					~
	A	В	С	D	E	F	G	۲.
1	DateTime	ICPsys[mmHg]	ICPdia[mmHgIC	CP[mmHg]	ICPpulse[mmHg]			
2	42668.57096	216.4	-3.937	0.744	220.4			
3	42668.57108	-2.629	-2.899	-2.743	0.2701			
4	42668.57119	-2.481	-2.647	-2.554	0.1663			
5	42668.57131	-2.406	-2.594	-2.511	0.1877			- 1
6	42668.57142	-2.396	-2.594	-2.498	0.1984			_
1	42668.57154	-2.396	-2.567	-2.484	0.1709			- 11
8	42668.57166	-2.396	-2.539	-2.481	0.1434			
9	42668.57177	-2.396	-2.539	-2.476	0.1434			_
1	42668.57189	-2.387	-2.539	-2.471	0.1526			_
1	42668.572	-2.387	-2.521	-2.468	0.1343			
1	2 42668.57212	-2.341	-2.521	-2.462	0.1801			
1	3 42668.57223	-2.368	-2.53	-2.464	0.1617			
1	4 42668.57235	-2.359	-2.503	-2.459	0.1434			
1	5 42668.57247	-2.341	-2.521	-2.453	0.1801			
1	6 42668.57258	-2.313	-2.503	-2.431	0.1892			
	7 42668.5727	-2.332	-2.512	-2.43	0.1801			
	8 42668.57281	-2.313	-2.503	-2.426	0.1892			
	42668.57293	-2.313	-2.503	-2.431	0.1892			
2	42068.57304	-2.332	-2.503	-2.433	0.1709			
Ľ	4 A AL DI Date	-2.322	-2.503	-2.425	0.1801			× 1
F	leady		a /			10% —		+

Appendix 1: Configuring ICM+ system options

Most of the programmable behaviours of the software can adjusted via the Settings menu. This menu can be found by clicking the Home tab and the Settings button.



In the Settings menu you will need to configure several things:

• On the General tab:

301010	Archiving	Display	Anaberia	Raw Data Rec	System
	Accinity	Cishiak	Milalyaia	Nam Data Nec	System
Resear	ch Group/Cer	ntre ident	ificator		
CAMB	RIDGE				
System	Configuration	Folder			
C:\Use	s\Public\Doc	uments\X	M+\syscor	fig\	6
User Pk	igins Folder				
C:\Use	s\Public\Doci	uments\K	M+\Plugins	1	1
Default	Configuration	Profiles	Folder		
C:\Use	sManuelDo	cuments\	ICM+\Config	ja/	
Default	Data Folder				
C:\Use	sManuelDo	cuments\	ICM+\Data\		1
D-1- D					1.5
Uata Fa	r warne r orm	01		10000000000000000000000000000000000000	
<proj< td=""><td>ECT>_<cent< td=""><td>RE>_<ai< td=""><td>NONYMD>_</td><td><date><time></time></date></td><td>1</td></ai<></td></cent<></td></proj<>	ECT>_ <cent< td=""><td>RE>_<ai< td=""><td>NONYMD>_</td><td><date><time></time></date></td><td>1</td></ai<></td></cent<>	RE>_ <ai< td=""><td>NONYMD>_</td><td><date><time></time></date></td><td>1</td></ai<>	NONYMD>_	<date><time></time></date>	1
Remov	e records wit	h NAN vi	alues while	exporting to text	file [

- The Research Group/Centre identification will be a unique name in the project that will identify the centre. This name should be fully inserted in capitals (ex. CAMBRIDGE).
- The Data File Name Format will be used to configure the structure to be used on the construction of the name of each data file. As each file generated in the study must have a unique identifier we agreed in using

a structure that uses the format highlighted in the picture. A description on how to build this File Name format is presented further down in this appendix.

• On the Archiving tab:

General Local ar Automat	Archiving	Display	Analysis	Raw Data Re	c Syster	n
Local an Automat	chiving					
Automat						
	ic Data Arch	iving at th	e recording	session end:	Ask	~
Create to	ext info files	for archiv	ved data		1	
Delete o	riginal data a	fter archi	iving		1	~
Archive	Root Folder	Location				
						Es
Archive	Folder Name	Format				and the second
<proje< td=""><td>CT>_<cent< td=""><td>RE>_<an< td=""><td>ONYMD>_</td><td>DATE><time></time></td><td></td><td></td></an<></td></cent<></td></proje<>	CT>_ <cent< td=""><td>RE>_<an< td=""><td>ONYMD>_</td><td>DATE><time></time></td><td></td><td></td></an<></td></cent<>	RE>_ <an< td=""><td>ONYMD>_</td><td>DATE><time></time></td><td></td><td></td></an<>	ONYMD>_	DATE> <time></time>		
Upload t	o a remote d	estination	1			
Default	Destination:	CEN	TER TBI		~	-1
202022		Brinkle	0.00000000			MAD.

- The Archive Folder Name Format will follow the same structure as the Data File Name Format. This setting is used for organising local archival storage of the data files.
- The remote server Upload (accessible via the upload function) default Destination can be selected here but it is the matching setting in the Project configuration that will ultimately take precedence.

• On the Raw Data Rec tab:



 The Use 'Start' button to control Raw Signals Recording must be checked if you are using ICM+ to record any data directly from bed side monitors • On the System tab:

5	Settings				×	
General Archiving Display	Analysis	Rav	v Data Rec	System		
Auto restore session in progr						
Auto restart recording at program startup Enable						
Inactivity time to software auto logout [min] 0						
Auto unlock program as user	:		Nurse			
Operating System Policy						
Use this program instead of	fWindows	shell	Disable			
Disable logoff/shutdown			Disable		•	
Disable Task Manager Disable						
Disable locking the computer Disable						
Disable Windows password change Disable V						
Windows Auto Login						
State Disable v	Password					
User	Confirm					
Patient description encryption Passphrase						
V OK X Cance	4	Keyb	oard			

 Set the Auto unlock program as user to Nurse. Setting the inactivity time to a value greater than 0, eg 10 min, will cause the software to auto login as that default user following a selected period of time without interaction with the software (this will only happen of course if the program was unlocked as another user) To build the **Data File Name Format** you will need to click the highlighted button and the following form will appear:

<centre></centre>	СТВІ_	
<project> <date> <time></time></date></project>	<centre></centre>	Free Text
<firstname></firstname>	CONTRACTOR	
<computer></computer>	<uate> <time></time></uate>	Please provid
<bedid> <patientid></patientid></bedid>		СТВ
<anonymid> <guid></guid></anonymid>		
<text></text>		
	🛨 🔺 🔻 🔀 🛋	
Name Sample		
CTBI_Cambridge_	CAM1234_20150105124302	

Input form	×
Free Text Element	
Please provide value for this text element	
СТВІ_	
OK	

In this form it is possible to add/remove any name element present in the Available Elements menu.

The '_' and any additional static text can be inserted by using the element '<text>' and inserting the text to be added manually.

Appendix 2: ICM+ configuration folders and files

ICM+ uses two locations (configurable via the Settings form) to store all its configuration files:

Location 1: C:\Users\<username>\Documents\ICM+.

There are two subfolders here:

'Data' folder, where all the data recorded during the acquisition process is stored, and

'Configs' folder, used to store the data collection and analysis configuration 'profile' files, as in the figure below.

Location 2: C:\Users\Public\Documents\ICM+

Here all the environment configurations/settings are stored. This location contains a folder called **Plugins**, where 3rd party function libraries reside, a folder called **TxtFilters**, containing parsing definitions for different text format data files, and a folder called **sysconfig** containing all the settings of the software, except the data collection and analysis profiles which are store in the Location 1 (as above). Although these files could be edited directly using a text editor ICM+ has specific user interface forms to edit all aspects of the program functionality.



Appendix 3: Editing ICM+ Projects

Projects contain various configurations specific to a particular research project. These can be edited using **Projects** button in the main menu tool bar.



Clicking this button will open the Project Management dialogue, where you create, copy, edit, delete, export/import selected projects to/from a file.

	Proje	ect Management		×
	Name	Abbreviation	Description	
<u> </u>	Traumatic Brain Injury	тві		
<u>С</u> ору	CENTER-TBI	СТВІ		
🝸 Edit				
💻 Delete				
🛃 Import				
Export				
🗸 ок				

Double clicking on a selected project or clicking on Edit will open a Project Editor where all the custom project settings can be modified.

The following screen shots describe the CENTER-TBI specific settings. These settings would have already been preconfigured for you if you have copied the provided project.ctb.xml file to the ICM+ sysconfig folder, or used the Project Manager to import the settings from that file. Please do not modify those for CENTER-TBI project.

Project Co	onfiguration									x
General	Data Fields	Events	Data Archiving							
Proje	ct Definition-						_			
Nar	ne:	CENTER-T	BI				 Abl	previation:	СТВІ	
Des	scription:									
Dat	a Folder: 0	C:\Users\p	eter\Documents\I	CM+\Data\Proj	jects\CENTE	ER-TBN				ן
Dat	a File Name F	ormat:	<pre><project>_<cei< pre=""></cei<></project></pre>	NTRE>_ <ano< td=""><td>NYMID>_<d< td=""><td>)ATE><time></time></td><td></td><td></td><td></td><td></td></d<></td></ano<>	NYMID>_ <d< td=""><td>)ATE><time></time></td><td></td><td></td><td></td><td></td></d<>)ATE> <time></time>				
•	к 🗶	Cancel	🛞 Keyboar	d						

1 . The project **abbreviation** will be part of the file name

2. **'Data Folder'** is a local folder where the data collected as part of this project will be stored

3. Data File Name Format lists elements that will be used to create automatic file names for each new data acquisition sessions. Please note that elements listed here will have to be filled in (e.g Centre ID, or the anonymous Patient ID) at the New Data Acquisition form stage before continuing.

eral Data Fie	elds Events Data	Archiving			
ata Fields Def	initions				
	Name	Caption	Туре	Description	
🛉 Add	GCS	GCS	Category	Glasgow Coma Score at admission	1
🌱 Edit	ст	CT Marshall score	Category	CT Marshall score at admission	
X Remove	ТуреТВІ	Type of TBI	Category	General type of brain trauma	
Move Up	Politrauma	Politrauma	Category	Other significant injury	
👆 Move Dn					

The data fields define placeholders for general clinical descriptors that characterise the patient at the time of admission to the critical care unit, that are useful to be kept together with the monitoring data.

Project Configuration					
General Data Fields Events Data Archiving					
Use Custom Events Form: Custom Form: CENTER-TBI					
Event Groups					
Al selected (checked) events					
CTBI CTBI CTBI CTBI CTBI CTBI CTBI CTBI					
Diagnostics F Suction CTBI Physio (Physio/movement) CTBI					
Diagnostics NPH [Osmo (Osmotheraphy) CTBI SedUp (Sedation UP) CTBI					
Fluid infusion SedDown (Sedation DOWN) CTBI SedBolus (Sedation Bolus) CTBI					
ICP control					
Intervention Other					
Intervention Surgical					
Measurements					
Medication Barbiturates					
Medication Bolus					
Medication Infusion					
* 🗵 🕂 🕅 🗙 🗹 🗇					
Cancel 🛞 Keyboard					

This is where events that are already defined elsewhere (in the Events form), listed in the left panel (1), can be assigned to the particular project (listed in the right panel 2.).

Please note that CENTER-TBI uses a customised event form, selected using the 'Custom Forms' list box (3). It is possible however to add more events to the project but those will only be accessible from within the 'Event List' panel, toggled from the main menu tool bar panel, Charts section.

Project Configuration	×
General Data Fields Events Data Archiving	
Show data packaging prompt at the recording session end	
Data Archive Folder	
Create New Subfolder	
I ✓ Create info text file	
Reset to defaults	
- Remote upload server Default Destination: CENTER TBI V	
Data Snapshots Show data snapshots reminders Snapshot length [minutes] East of timepoints for data snapshots [hours] 2,12,24,48,72,96	
Cancel 😵 Keyboard	

Here one can define the location and format of data archives as well as, essentially for CENTER-TBI:

- This should be ticked in order for you to be prompted to convert the file to HDF5 at the end of the recording session
- 2. the destination of the remote server for data uploads,
- 3. the data snapshot length and the data snapshot reminders

Appendix 4: Registering ICM+

When ICM+ is successfully installed for the first time in a computer it needs to be registered. This will probably already be done for you when you get the laptops, but if any major update needs to be done you will have to register it again.

To register ICM+ you need to press the Registration button on the Home tab.



This will bring up the Detailed ICM+ License Info window where you will need to press the Register New Key button.



This will bring forth the ICM+ Registration Form and here you will have to press the Copy Details.

nstallCode:	Please quote this code for a 485ACBC6D289	iny further assistance
Username:	ICMadmin	
Institution:	Institution Name	
Computer:	CTBI-Copenh2	
	Copy Details	🗺 Email Details
~		

This will let you paste the details anywhere you want. You will then have email those details to Dr Peter Smielewski (<u>ps10011@cam.ac.uk</u>) or Manuel Cabeleira (<u>mc916@cam.ac.uk</u>) so that we can generate your product key and send it to you.

You will then have to paste the Key to the highlighted space and click Register now. If you are successful you will see the Registration successful dialogue.

ICM+	×
Registration was sucessful	
	ОК

And your Detailed ICM+ License Info window should look like this:

ICM+ Registration Status		3rd Party Plugins	
Registered To: ICMadmin		, ,	
Institution:			
Registration Valid Until : 31/12/2016			
Registered Features			
Data Acquisition And Real-time Analysis	1		
Customisable Analysis Configuration	1		
Raw Signals Recording	1		
Off-line Analysis of Raw Signals	1		
CSF Dynamics Tools	1		
Cerebrovascular Reactivity Tools	1		
PREgister New Key			
Installed Monitor Modules			
Simulator			

Appendix 5: Preconfigured users and passwords

Administrator – 2718 Manager – 1618 Operator – 3142 Nurse – 1414

The users, their passwords, and their rights are fully configurable in the software, using Users form. The default users have been chosen to fulfil the following roles:

User	Role
Administrator	Complete access to all the software configuration options, the users and passwords
Manager	Access to all the configuration options, except the users and password. This will normally be the user to do the entire configuration needed for data collection.
Operator	Control of the data collection process using preconfigured profiles, and changes to the charts layout and properties.
Nurse	Access to clinical annotations tools only. This should be normally set up as the default user kept logged-in during the data collection process, in order to prevent any inadvertent disruption to data recording but at the same time allowing and encouraging quick access to the clinical annotations.
Guest	This 'user' has no rights, making it impossible to interact with the software in any way.

Appendix 6: Description of the data export connector for GE Datex-Ohmeda and Carescape monitors

GE Datex Ohmeda S/5

USB-to-Serial adapter connected to the computer

Standard null modem serial cable connecting the monitor (fig below) and the USB-to-Serial adapters



GE Carescape B 650/850

USB-to-Serial adapter connected to the computer

Standard null modem serial cable connecting the two USB-to-Serial adapters

ATEN UC-232A USB-to-Serial adapter connected to any USB port s on the Carescape



monitor

