Grant agreement no. 769051

EpiCARE – a network for rare and complex epilepsies

HP-ERN-2016 European Reference Networks / Framework Partnership Agreement

D9.1 SOP for European Babylink

Work Package: WP9: Neonatal seizures

Due date of deliverable: 28 Feb 2018

Actual submission date: 26 February 2018

Start date of project: 1st March 2017 Duration: 12 months

Lead beneficiary for this deliverable: *27 EpiCARE centres*
Contributors: *Dr* Ronit Pressler; Professor Geraldine Boylan

Project co-funded by the European Commission within the HP-ERN-2016 European Reference Networks grant		
Dissemination Level		
PU	Public	x

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1. Version log

Version	Date	Released by	Nature of Change
1.0	31.01.2018	R. Pressler (GOSH)	First version

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2. Definition and acronyms

Acronyms	Definitions
EEG	Electroencephalogram
IT	Information technology
ERN	European Reference Network
NICU	neonatal intensive care unit
aEEG	Amplitude integrated electroencephalography
MRI	Magnetic resonance imaging

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3. Introduction

Neonatal seizures are a major diagnostic challenge for clinicians because clinical presentations can be very subtle, electro-clinical correlation variable and there is generally a poor response to antiepileptic drugs.

Interpretation of **neonatal EEG is a highly specialised task** and a thorough knowledge of the maturational changes that exist across all gestational ages is required. In addition, this expertise must be available on a 24/7 basis to meet the needs of the neonatal intensive care unit environment.

Over the last number of years, we have developed the Babylink platform (Prof Geraldine Boylan), **a web based IT platform for streaming neonatal EEG on a 24 hour basis** where it can be interrogated by novel neonatal seizure detection algorithms.

This platform provides support to hospitals where EEG expertise is not readily available. Through the EpiCARE network we aim to scale this platform to a European population of neonates with seizures and we will identify a group of experts from the ERN centres who will be available to provide oversight for the platform

The overall objectives of the work package are the following:

- To establish a European neonatal seizures expert group
- To provide guidelines for EEG monitoring in neonates with acute seizures and epilepsies across Europe
- To scale up the neonatal EEG remote monitoring platform (Babylink) for use across Europe
- To develop management guidelines and treatment protocols for neonatal seizures
- To define and implement standardised outcomes of neonatal seizures that can be applied across EpiCARE
-

The work package set the following goals for Year 1:

- Create an Neonatal Seizure expert group
- Establish the framework for the European Babylink platform to our EpiCARE sites (with WP4 and I)
- Become member of ENPR-EMA network

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4. Activities carried out and results

4.1. Neonatal EEG survey

A survey of 10 questions sent to all EpiCARE centres looking after the paediatric population throughout Europe requesting information on their numbers and management of neonates who experience seizures.

Questionnaire on Neonatal seizures – EpiCare WP9

General information about your center

1. Name of the center
2. Name, email address of person who completed this survey
3. Do you have neonates in your center? Yes / No
    a. Maternity ward and NICU?
    b. Tertiary referral only?
    c. Both
    d. Other: _____

Information on neonatal seizure at your center

4. How many neonates with seizures do you have in your center per year?
    a. In NICU ….
    b. On neurology ward….
    c. As out patients (eg for EEG from outside)
5. For neonatal seizures do you perform (tick all you do)
    a. Routine EEGs
        i. Yes / no
        ii. How many / y
        iii. Duration:___ min
    b. EEG monitoring
        i. Yes / no
        ii. How many / y
        iii. Duration:___ hr
    c. aEEG
        i. Yes / no
        ii. How many / y
        iii. Duration:___ days

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6. Do you do routine neurodevelopmental follow up in neonates with seizures? If so, please specify.
7. Do you do perform MRI in all newborns with seizure?
    a. Yes all babies
    b. Many but not all. Please specify criteria _____
    c. Only few. Please specify criteria_____
8. Do you do perform genetic panels in neonates with seizures? If so, please specify.
9. Do you do perform genetic panels in neonates with seizures? If so, please specify.
10. Does your center have imaging databases of epilepsy patients?
    a. If so, which cohorts, and how many patients?
    b. Does this database include acute neonatal seizures?

11. Would you like your center to be actively involved in EpiCARE neonatal seizure groups?
    a. Yes
    b. No
    c. Maybe

12. If yes, please provide names/email addresses of collaborators in your center

Name: _____
Centre: _____
Position: _____
Email: _____

4.2. Neonatal EEG survey results

The survey on neonatal seizures were sent to all EpiCARE members with a paediatric unit. Out of the 28 EpiCARE centres 26 centres were contacted with the survey, as 2 of these centres offer treatments for adult only. One further centre, the Irish Centre For Fetalpediat and Neonatal Translational Research, Cork University Maternity Hospital, is recognised as an affiliated member only, not a full member of the EpiCARE network, however their responses are being included in the analysis. Of the 27 centres, across 14 countries twenty-three (88.5%) of centres cared for neonates, therefore the total analysis will be calculated on the 24 centres (including the affiliated member) that care for neonates.

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Approximately 878 neonates per year experiencing seizures are noted to be admitted to the NICU (Mean= 36.6/year/centre), with 18 centres (75%)) caring for neonates experiencing seizures on their neurology wards (mean = 21.2/year/centre) and 20 centres also managing neonates with seizures as outpatients for specific procedures.

22 centres recorded performing routine EEGs for neonates that have seizures with a variation in duration which a range of 20-240minutes and 22 centres also perform EEG monitoring lasting from 2-120 hours.

It was recorded that fewer centres (19/24) conduct aEEG monitoring on this cohort of neonates but these were noted in the majority of centres to last longer than the EEG recordings, with a maximum length of 8 days noted (range=1-8 days).

Of the 24 centres with neonates 2 did not respond to the question asking about routine neurodevelopment being offered to neonates with seizures and of the remaining 20, 1 did not offer routine neuro development follow up and 1 based which form of follow up was to be received on the status of the baby at the time of discharge from the Neonatal unit.

Genetic panels were completed in 23 centres for neonates with seizures, but these were noted to be not routine and they were conducted only when there was an unknown cause, or etiology for the seizures, or when the seizures were unresponsive to medication.

Most of the centres performed MRI scans on all those neonates that had seizures and those conducted them on not all but most of these neonates there criteria for performing the MRI was when there were no haemorrhages already identified on ultrasound, were there were abnormalities noted in the baby or their development or where there was not acute symptomatic seizures.

Only 14 centres were noted to have an imaging database with one of these only having a database of those infants that had been treated with hypothermia, 12 of these centres included neonates at some level in their databases or had a separate neonatal database.

22 centres would like to be involved in the EpiCARE neonatal seizure group, with 1 group specifying it depends on the project that is to be undertaken.

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4.2 Members of the Neonatal Expert group:

An expert group 'Neonatal seizure' has been initiated and the members are as follows:

Members of the Expert group:

1. Gunnar Naulaers, gunnar.naulaers@uzleuven.be, UZ Leuven Leuven, Belgium
2. Philippe Derambure; Sylvie Nguyen, sylvie.nguyenthetich@chru-lille.fr, Laurence Chaton laurence.chaton@chru-lille.fr, Lille University Hospital, Lille, France
3. Paola De Liso, Paola.deliso@opbg.net, Bambino Gesù Children's Hospital, Rome, Italy
4. Sofia Quintas, sofiamendesquintas@gmail.com, CHLN - Hospital Santa Maria Lisbon, Portugal
5. C Robalo, c.robalo@chuc.min-saude.pt, labeeg@chuc.min-saude.pt, cristina.pereira@chuc.min-saude.pt, Centro Hospitalar e Universitário de Coimbra , Coimbra, Portugal
6. Anna Kaminska, anna.kaminshka@aphp.fr, Monica Eisermann, monica.eisermann.aphp.fr, Necker Enfants Malades, Paris, France
7. Julia Jacobs, Julia.jacobs@uniklinik-freidburg.de, Al Obregia Hospital, Bucharest Bucharest, Romania
8. Carmen Fons, cfons@sjdhospitalbarcelona.org, Victoria San Antonio, vsanantonio@sjdhospitalbarcelona.org, Hospital Sant Joan de Déu, Barcleona, Spain
9. Ronit Pressler, Ronit.pressler@gosh.nhs.uk, GOSH, London, UK
10. Geraldine Boylan, g.boylan@ucc.ie, Cork University Maternity Hospital, Cork, Ireland
11. Sameer Zuberi, sameer.zuberi@nhs.net, Queen Elizabeth University Hospital Campus, Glasgow, Scotland
12. Dorota Domanska-Pakiela, dorp@mp.pl, Magdalena Kaczorowska-Frontczak, Magdalen_Ka@tlen.pl, The Children's Memorial Health Institute, Warsaw, Poland
13. Dorothee Ville, dorothee.ville@chu-lyon.fr, Hospices Civils De Lyon (HCL), Lyon, France
14. Tiziana Pisano, t.pisano@meyer.it, Meyer-University of Florence, Florence, Italy
15. Jarkko Kirjavainen, jarkko.kirjavainen@kuh.fi, Kuopio University Hospital, Kuopio Finland
16. Lena Westas, lena.westas@kbh.uu.se, Johan Agren, johan.agren@kbh.uu.se, Gothenborgh and Uppsala, Upsala, Sweden
17. Katalin Sterbova, katalin.sterbova@fnmotol.cz , Motol Epilepsy Centre, Prague, Cz
18. Linda S de Vries, l.s.devries@umcutrecht.nl, UMCU, Utrecht, NL
19. Teresa Temuda, Teresatemudo@hotmail.com, Rui Chorao, rui.chorao@gmail.com, Ruben Rocha, rubenrocha@gmail.com, Carmen

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Carvalho, carmencarvalho@gmail.com, Centre - Centro Hospitalar do Porto, Porto, Portugal

20. Ondrej Horak, horak.ondrej@fnbrno.cz, Brno Epilepsy Centre, Brno, Czech Republic
21. Patricia Smeyers, patricia.smeyers@gmail.com, Hospital Universitaro y Politecnico La Fe, Valencia, Spain
22. Diana Barca, diana_barca@yahoo.com, Cristina Motoescu, cristina.motoescu@yahoo.com, Crisitna Minca, minca_cristina@yahoo.com

4.3. SOP for Babylink

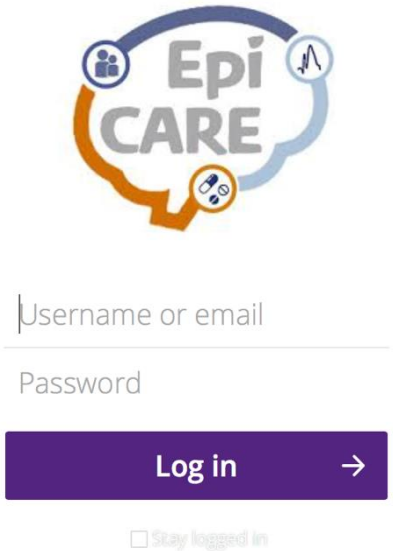
Babylink is a bespoke IT platform for collaboration, education and training on neonatal seizures within the EPiCARE ERN.

Babylink was developed by the INFANT research centre and was previously used in the NEMO FP7 project to provide support to non-expert EEG centres on the recognition of neonatal seizures.

In the EPiCARE ERN we aim to develop this platform further so that it is available on a central server and can be accessed easily by the consortium. We have also rebranded this platform to 'EEGlink' which is specific to the EPiCARE ERN.

The overall aims are to:

4 Develop EEGlink on a centralised platform for upload and download of neonatal EEGs that is accessible to all members of the consortium.
5 Integrate an EEG viewer to this platform so that EEGs can be viewed without the need for any specialised software on a local computer.
6 Integrate the INFANT neonatal seizure detection algorithm on to this platform to help with the recognition of neonatal seizures
7 Provide a repository for anonymised neonatal EEGs especially those with unusual causes and characteristics.
8 Develop an e-learning module integrated to this platform for education and training on neonatal seizures.



To date, a new platform has been established for EPiCARE called EEGlink and can be accessed using the following address:

medcloud.ucc.ie

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The upload function can be used to upload anonymised EEG files in EDF format to the EEGlink platform. Files are stored in a secure server managed and owned by the INFANT Research Centre, University College Cork, Ireland.

EEGlink uses industry-standard SSL/TLS encryption for data transfer. Data in storage can be encrypted using a default military grade AES-256 encryption with server-based or custom key management. Optionally and on a per-folder basis data can be end-to-end encrypted on the client with the server assisting in sharing and key management using a Zero-Knowledge model.
EEGlink meets all Technical safeguards requirements, supporting full compliance with the Health Insurance Portability and Accountability Act (HIPAA) of 1996.

EEGlink supports GDPR requirements including:

- Advanced Access Control capabilities
- Automatic expiration of passwords
- Account lockout upon multiple failed log-in attempts
- Automatic virus scans
- Secure data backups
- Audit-ready logging of all user actions
- Data-at-rest, in-transit and full end-to-end encryption
- Email verification and two-factor authentication

Each user is issued a unique username and password that allows access to a secure folder where files can be loaded for review by an EEG expert. EEG experts expert access the EEG files through secure user accounts.

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6 Standard Operating Procedure for BabyLink

Infant
Irish Centre for Fetal and Neonatal Translational Research

Standard Operating Procedure (SOP)

for

Upload of files to EEGlink

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SOP Number:	XX	Effective Date:	14 FEB 2018
Version Number & Date:	Version 1.0	Review Date:	14 FEB 2019
Author: Co Author:	Geraldine Boylan Mairead Murray	Title: Professor of Neonatal Physiology Title: Clinical Research Manager	
Reviewed By:		Title:	
Approved By:		Title:	
Approved By:		Title:	

SOP Chronology		
SOP Version Number	Reason for Change	Author

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1 Guides

This document (also referred to as a Standard Operating Procedure: SOP) is identified by code CLINICAL_XX. The code identifies the category of the document; (ADMIN/LAB/CLIN, and the number of the document from a list of other central SOPs; 001/002/003. The chronological history of this document can be found on the first page.

2 Scope

The SOP is pertinent to all users of the EEGlink system who are uploading to or managing EEG files on the EEGlink platform.

3 Purpose

The purpose of this EEG is to provide detailed instructions on how to login to and upload EEG files to the EEGlink Platform. Access to the EEGLink platform will be given to specific personnel at Insitutions that have agreed to the use of the EEG link Platform for the upload and storage of EEG files centrally for the purposes of the EpiCare Network.

4 Responsibility

It is the responsibility of the INFANT IT Manager to ensure that login details are provided to those individuals identified by the EpiCARE Network as requiring access. It is the responsibility of personnel involved in uploading EEG files to the EEGlink Platform to follow and adhere to the procedures outlined in this SOP.

5 Definitions/Abbreviations

EDF - European Data Format

EEGlink - A customised web-based platform that allows the upload of anonymised EEG file for retrospective review by an EEG expert

EEG – Electroencephalography

N/A - Not applicable

SOP - Standard Operating Procedure

6 Materials & Equipment

N/A

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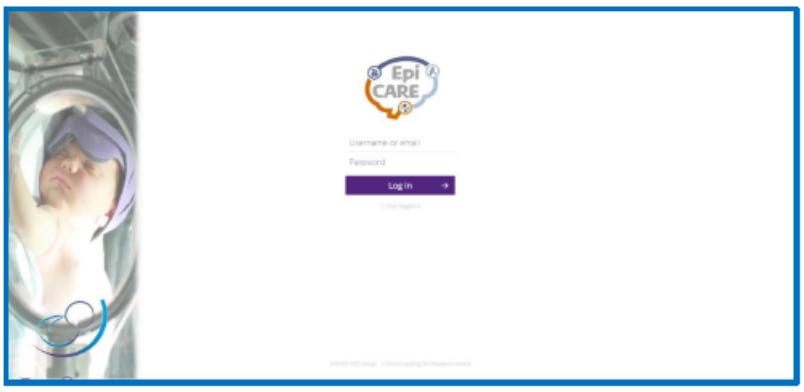
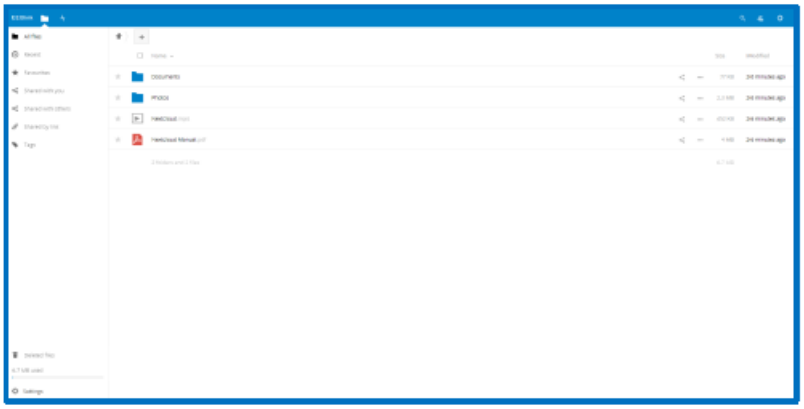
7 Procedures

Please type the webaddress medcloud.ucc.ie into Internet explorer or Google Chrome. The Login page below will appear. Please enter your username and password and click on the login tab



This will bring you to the home page



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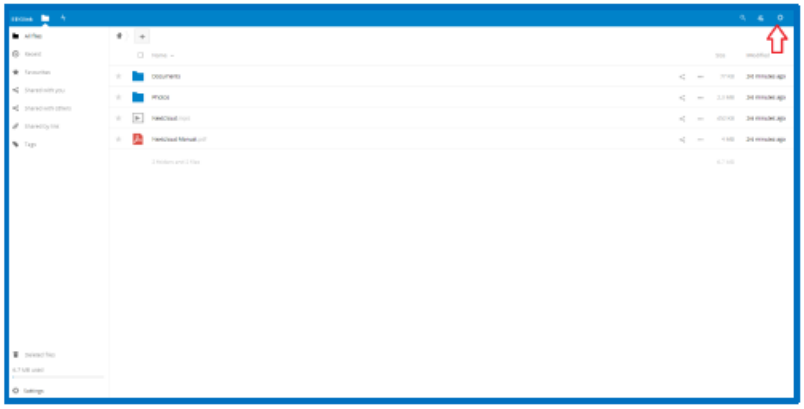
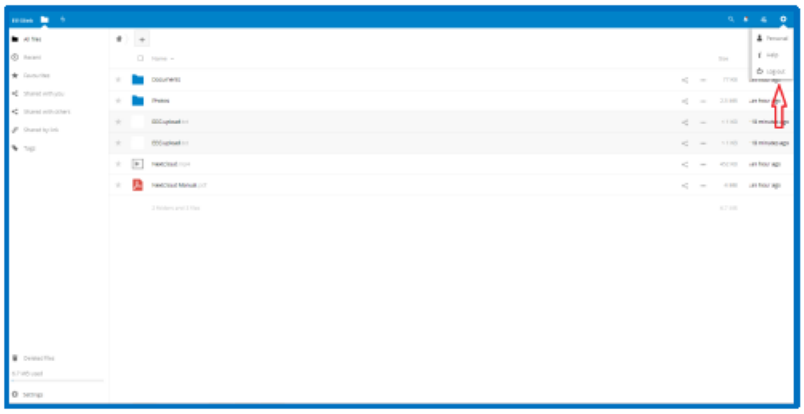
The top right of the page is the settings button



If you click the settings button a drop down menu will appear with three options,

1. Personal - you can alter or add information to your user profile here.
2. Help – This will bring you to an electronic version of the User Manual
3. Logout – This will allow to logout from the application/website



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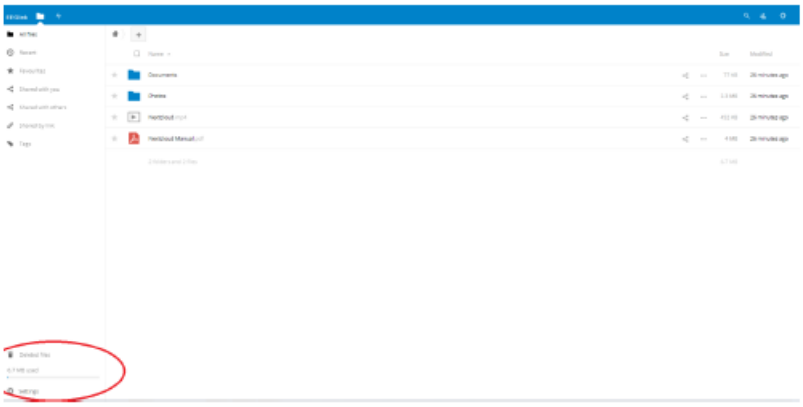
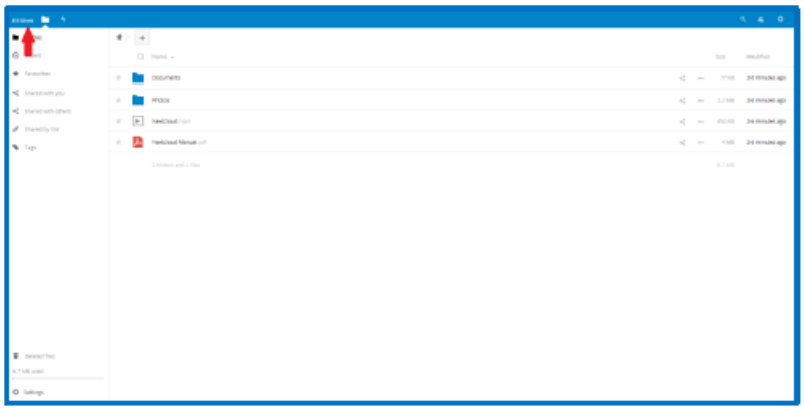
At the bottom left of the page you will see your storage quota and the amount of storage that is currently in use.



The top right is the EEGlink Logo and this will bring you back to the home page



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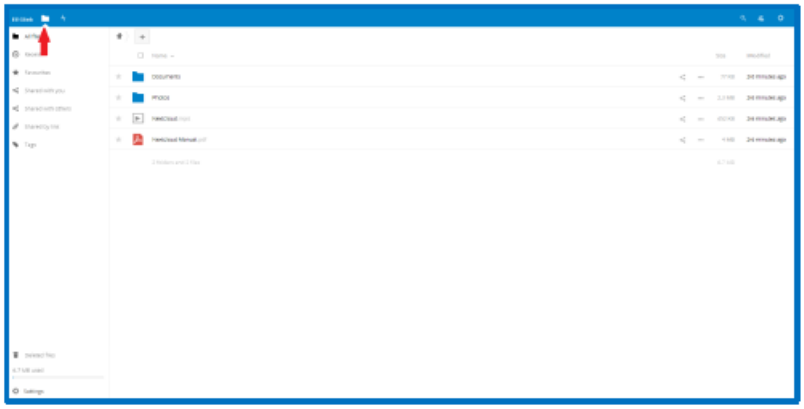
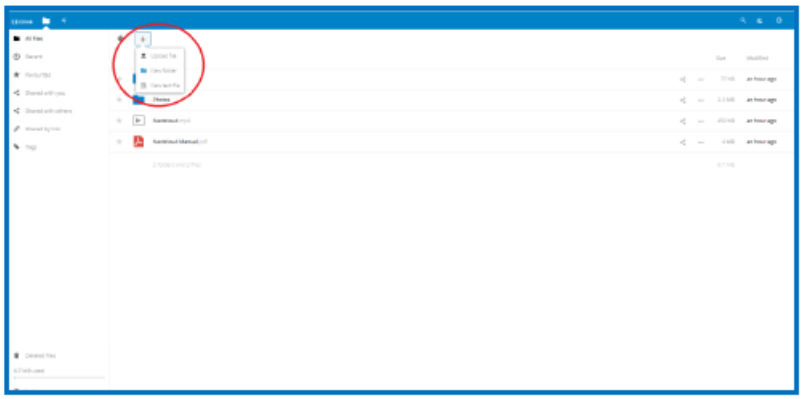
Next to the INFANT logo is the folder icon which if you click on it will bring you to the files and folders page. Each user account will be set up with a folder in the following Naming format Username_EEG_Upload Folder. Anonymised EEG files should be uploaded to this folder.



There is a plus (+) icon at the top of the window. If you click on this a drop down appears with three options

1. Upload file - click on this to upload a file from your computer
2. New Folder - this will allow you to make a new folder
3. New Text file - this will allow you to start a text file into which you can type notes directly



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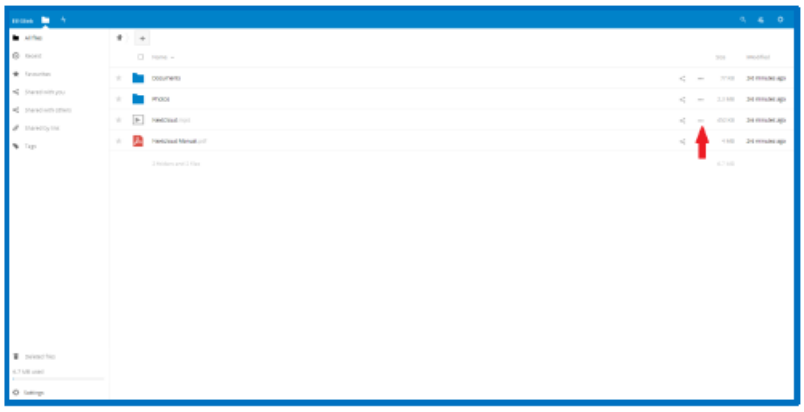
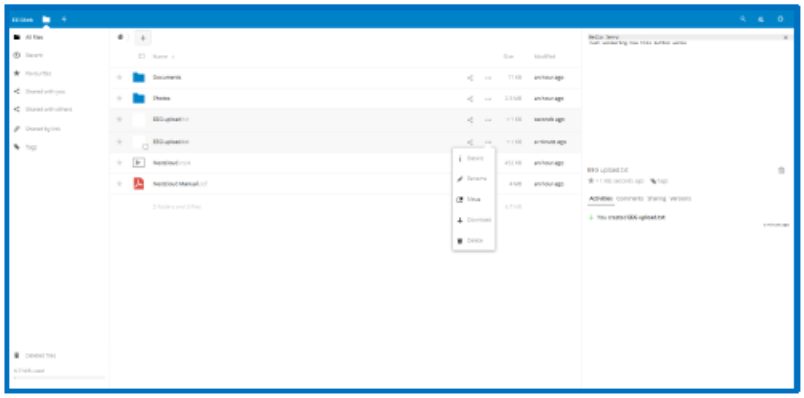
Next to each file or folder is an icon consisting of three dots



Once you click on this icon a dropdown appears with 5 options for the file selected;

1. Details - information on the file
2. Rename – Change the name of the file
3. Move - move the file to another location on EEGlink
4. Download – the file from EEGlink
5. Delete – remove or delete the file from EEGlink



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The upload function can be used to upload anonymised EEG files in EDF format to the EEGlink platform. Please refer to the user manual of the EEG software used to record the EEG to find details on how to extract an anonymised EDF file. This may have to be completed in two steps, one to remove any identifying details such as Date of Birth, name, address and age etc. from the EEG file and another step to extract the file in an EDF format.

Files are stored in a secure server managed and owned by The INFANT Research Centre, University College Cork, Ireland. EEGlink uses industry-standard SSL/TLS encryption for data in transfer. Data at rest in storage can be encrypted using a default military grade AES-256 encryption with server-based or custom key management. Optionally and on a per-folder base data can be end-to-end encrypted on the client with the server assisting in sharing and key management using a Zero-Knowledge model.

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- Automatic virus scans
- Secure data backups
- Audit-ready logging of all user actions
- Data-at-rest, in-transit and full end-to-end encryption
- Email verification and two-factor authentication

Each user is issued a unique username and password that allows access to a secure folder where files can be loaded for review by an EEG expert. EEG experts expert access the EEG files through secure user accounts.

The EEGlink system should not require training to operate as it is designed to be user friendly and detailed instructions are included in the SOP. If help should be required the user should click the settings button located on the top right of the home screen and from the drop down chose the Help option. This will bring you to an electronic version of the User Manual.

Please do not forget to logout from EEGlink once you have finished with the platform. Do not share your EEGlink password or logins and do not use your browser to save or remember the password

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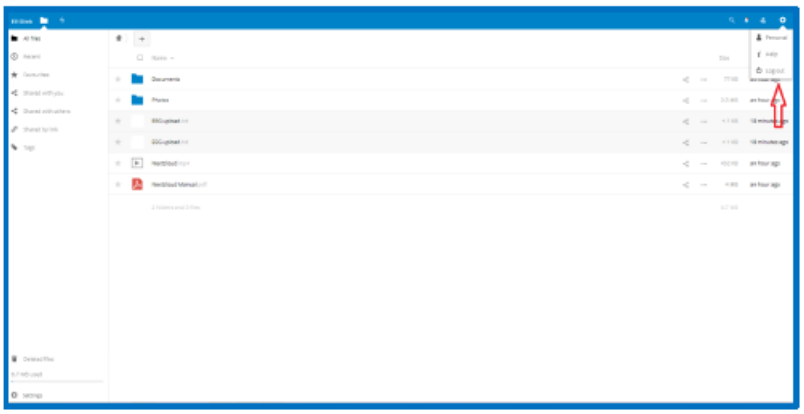

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8 Reference to Other SOPs, Regulations, Guidelines

N/A

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