NPRP

Progress Report Number 5

Project Number

NPRP 6 - 885 - 2 – 364

Project Title

Localization of EEG Abnormalities for Improving Brain Monitoring of Newborn Babies at Risk of Brain Injury using a multichannel time-frequency signal processing approach

Date: January 2017

Authors: B. Boashash[1,2,3] and Paul Colditz[2,3]

Sponsor:

Qatar National Research Fund

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[2] The University of Queensland, Perinatal Research Centre, School of Medicine, Brisbane, Australia
3 The University of Queensland, UQ Centre for Clinical Research, Brisbane, Australia

Progress Report View

Report Information

Proposal Number:	NPRP 6 - 885 - 2 - 364	**Awarded Amount:**	$1,050,000.00	**Sub. Institution:**	Qatar University
Lead Investigator:	Prof. Boualem Boashash	**Lead Institution:**			
Project Status:	Award Active	**Start Date:**	23-Feb-2014	**End Date:**	23-Jun-2017
Current Year:	Year 3 of 3	**Report Type:**	Interim		
Report Period:	5	**Report Status:**	QNRF Accepted	**Version Number:**	4
Due Date:	25-Dec-2016	**Submitted Date:**		**Vetted Date:**	04-Jan-2017

Proposal Title: Localization of EEG Abnormalities for Improving Brain Monitoring of Newborn Babies at Risk of Brain Injury using a multichannel time-frequency signal processing approach

Research Progress

Aim 1: EEG Data acquisition, labelling, and pre-processing

Start Month: 1 **End Month:** 36 **Completed?** No **Completed Percentage:** 85%

Tasks associated with this aim for this period as per the original proposal:

We will continue acquiring data to increase the database size for developing and validating EEG abnormality detection/classification techniques and source localization algorithms.

Have you experienced any difficulties?: Yes

There were issues related to appointments as discussed in Aim 7. This resulted in insufficient personnel to work on the tasks and thus delayed dataset building.

Progress made, accomplishments achieved, and plans to tackle the difficulties listed above (if any):

We continued to collect and label newborn EEG data to build an adequate newborn EEG dataset for validating EEG abnormality detection/classification as well as source localization. In the collected EEG data, we identified obvious skin stimulation patterns of 1Hz (corresponding to a touch on the right hand per second during the recording). Such recording is useful in validating the proposed source

localization methods. Regarding the personnel, Prof Paul Colditz has allocated more time than planned for data labeling, given difficulties in recruitment. During the grace period, we interviewed a new post-doc candidate who has substantial background knowledge and technical skills; he will join the Australian team at UQ and work on the project, with this aim being one key focus. (In addition, Dr. Hichem Barki was appointed in the Qatar team).

Supporting Documents

- Database_description_updated.pdf

Aim 2: EEG Abnormality detection using multi-channel t-f signal analysis methods

Start Month: 1 **End Month:** 30 **Completed?** No **Completed Percentage:** 87%

Tasks associated with this aim for this period as per the original proposal:

1. We will further develop and analyze the multi-channel feature fusion and multi-classifier approaches to the detection of EEG abnormalities. 2. We will include new features and adopt recent machine learning techniques to increase the performance of the detectors and classifiers for multiple new datasets. 3. We will also consider other effective approaches to combining the multichannel EEG data. 4. We will propose a new time-frequency pattern recognition approach using more discriminating time-frequency image features and validate it on newborn EEG seizure detection.

Have you experienced any difficulties?: No

Progress made, accomplishments achieved, and plans to tackle the difficulties listed above (if any):

We have finalized a study called: "Automatic signal abnormality detection using time-frequency features and machine learning: A newborn EEG seizure case study", it is now published in the Knowledge-Based System journal (IF: 3.325). The findings are: 1. The Compact Kernel Distribution gives the best classification results. 2. Among the compared fusion methods, feature fusion brings up to 4% classification accuracy. 3. Wrapper method sequential forward feature selection improves the overall classification performance. 4. For clinical applications where the correct diagnosis of patients is critical, a new performance measure for TF feature selection is defined to improve sensitivity. To further demonstrate the benefits of TF representations for signal classification, we are currently conducting a study and developing a new pattern recognition approach, by considering TF representations as images, and proposing new TF image features like Hu moments, Haralick features, and Local Binary Patterns (LBP), which provide invariance properties and localization information, compared to TF signal features and 1D ones. For signal classification in general and newborn EEG seizure detection particularly, we obtained promising results summarized as: 1. ROC analysis shows that for all considered TFDs, TF Hu image features outperform both TF extended features and 1D features. 2. Using an SVM classifier, we have shown that EMBD gives the best accuracy, sensitivity, and specificity for TF Hu image features, while ADTFD is the best performing for TF Haralick image features. 3. In general and for all TFDs and measures, TF Haralick image features

outperform both TF signal features and TF Hu image features and achieve up to 30% improvement. 4. Combining the previous results clearly indicates that in general, image features show a substantial improvement of all classification measures in the TF domain.

Supporting Documents

- Knowledge-Based_Systems.pdf

Aim 3: Designing a head model for neonates

Start Month: 1 **End Month:** 12 **Completed?** No **Completed Percentage:** 85%

Tasks associated with this aim for this period as per the original proposal:

We will continue our work to create new and authentic real head model for the localization of EEG abnormalities and connectivity analysis.

Have you experienced any difficulties?: No

Progress made, accomplishments achieved, and plans to tackle the difficulties listed above (if any):

We have validated the realistic head modelling software using an adult MRI. We have also established the head model using manually segmented newborn MRI. To achieve this, the newborn head structure was defined using Matlab software Brainstorm. Then, the lead field matrix was calculated using boundary element method by Matlab software OpenMEEG. Technical and parameter details are provided in the report attached. A manuscript for a paper submission is being prepared based on the report. The relevant codes and data for newborn head modeling have now been delivered to Qatar for testing source localization methods. In the meantime, we are also improving the automated MRI segmentation so that clear and accurate structural regions can be developed. Now we are liaising with the developer of the automated MRI segmentation method to modify the implementation codes so that the output can generate the expected head model directly in the software. This is considered as a major advance made in the last three months, and it is the key that now allows likely success of this project. However, we plan to submit a request for extension so as to finalize the project properly.

Supporting Documents

Aim 4: EEG source localization, and validation of the techniques developed

Start Month: 13 **End Month:** 36 **Completed?** No **Completed Percentage:** 75%

Tasks associated with this aim for this period as per the original proposal:

Newly developed MUSIC based localization techniques will be applied and illustrated on both synthetic and real neonatal head models with corresponding EEGs. The MUSIC algorithm will be studied and compared for the cases: 1) time

domain 2) Region of Interest Selection in the time- frequency plane using image processing 3) high energy time-frequency points selection and IF estimation in the time-frequency plane using IF estimation techniques 4) using 2) & 3) for the underdetermined case where we assume that the number of sources is greater than the number of sensors.

Have you experienced any difficulties?: No

Progress made, accomplishments achieved, and plans to tackle the difficulties listed above (if any):

1. A new method is developed to improve source localization. Spatial time-frequency distributions (STFDs) have been considered for both blind source separation (BSS) and direction of arrival (DOA). The proposed approach is more robust to noise because the thresholding step is now based on a statistical test that accounts for the false alarm probability while in previous reference study the parameters for the noise reduction step were chosen empirically. More precisely, the test is based on the probability density function (pdf) of the sum of the auto-sources QTFDs, where each source follows a Laplacian law. In addition, the use of high resolution TFDs such as multi-directional distribution (MDD) or compact kernel distributions (CKD) allows an accurate estimation of the component IF law which is the key non-stationary signal parameter and the improvement of mixing matrix estimation. The proposed algorithm showed an improvement of source localization accuracy on simulated signals, in terms of Normalized Mean Squared Error (NMSE) for both BSS and DOA, compared to previous studies. We also used a linear antenna model to validate the proposed approach and the results

showed an improvement of 7% on simulated data for DOA estimation compared to previous reference studies. All these results have been submitted to IEEE transactions on signal processing in a paper called: ”Improving DOA estimation Algorithms using High-Resolution Time-Frequency Distributions”. 2. With the accurate newborn head model built in Aim2 in this report period, the testing of newly developed methods (improved TF-MUSIC, BSS and DOA based methods) for localizing simulated sources is being initiated by the Qatar team. The testing underway includes localizing the simulated sources using the head model and identifying regions where skin simulation is originated (using the data described in Aim1). Success of the testing will validate the proposed source localization methods.

Supporting Documents

- Improving_DOA_estimation_Algorithms_using_High_resolution_time_frequency_distributions_Ouelha_Aissa_El_Bey_Boashash.pdf

Aim 5: Connectivity analysis for EEG abnormality characterization at both scalps and source levels

Start Month: 19 **End Month:** 30 **Completed?** No **Completed Percentage:** 30%

Tasks associated with this aim for this period as per the original proposal:

1. Use the results of AIMs 1, 2 and 4 to study the physical location of the different scalp level abnormalities. 2. Track the behavior of the sources in the brain when the abnormality spreads or migrates from one part of the scalp to another.

Have you experienced any difficulties?: Yes

A delay was introduced because of the cancellation of the employment of Dr. Sadiq Ali by The University of Queensland due to an ethics issue: publication of a non-authorized paper as shown in the supporting documents. The paper acknowledges the grant but it was published without the knowledge of the PIs and with an inappropriate affiliation (submitted while Dr Sadiq was still working at Qatar University and 1 month after Dr Nabeel left as Post-Doc on the other grant; an action against these 2 former Postdocs is recommended). So, this task has not progressed (see AIM 7 for details).

Progress made, accomplishments achieved, and plans to tackle the difficulties listed above (if any):

Since the interaction between sources in the brain is dynamic, we are focused on the directional connectivity analysis methods that account for time-varying changes of interactions between sources, such as time-varying partial directional coherence. The newly recruited post-doc will be involved in the study in this Aim. We plan to submit a request for extension so as to finalize the project properly.

Supporting Documents

Aim 6: Design of new Time-Frequency Signal Processing methods including theory, algorithms and implementati

Start Month: 1 **End Month:** 36 **Completed?** No **Completed Percentage:** 85%

Tasks associated with this aim for this period as per the original proposal:

Continue to develop time-frequency methods associated with Aims 1, 2, 4 & 5 and improve these methods, in terms of accuracy and effectiveness.

Have you experienced any difficulties?: No

Progress made, accomplishments achieved, and plans to tackle the difficulties listed above (if any):

We developed a new time-frequency (TF) representation, named locally optimal spectrogram (LOS), based on short-time fractional Fourier transform. This method automatically determines the locally optimal window parameters and fractional order for all signal components and thus results in a high resolution and cross-term free TFD. A paper based on this work has been submitted to the “Digital Signal Processing” journal. We also developed new high resolution TFDs of multicomponent non-stationary signals that can be approximated using piece-wise LFM signals. The new TFD, named Multi-Directional Distribution (MDD), represents the signal in the ambiguity domain and applies a multi-directional signal dependent kernel that accounts for the direction of the auto-term energy. A procedure based on Radon transform is used to set the parameters automatically. Results on simulated and real data validate the MDD performance, showing up to 8% gain compared to other TFDs using the Boashash-Sucic criterion. This study has been submitted to the IEEE Transaction on Signal Processing journal (an abstract is attached). In addition, we developed a TF classification method for detecting neonatal seizure and other EEG abnormalities as described in Aim2. This method has increased the detection and classification accuracy and effectiveness. Such outcome has been published in the Knowledge-Based

Systems journal. We advanced the following tasks to streamline the algorithms described in Professor Boashash's book: 1. Designing, reviewing and verifying the algorithms described in the Time-Frequency Signal Analysis and Processing 2nd Edition book. 2. Creating an inventory/checklist for all the algorithms included in the TFSAP book as they are a main resource for this research project. 3. Reviewing, validating and verifying the TFSAP Toolbox 7.0, as it is a main tool for this project.

Supporting Documents

- Knowledge-Based_Systems.pdf
- Abstract_for_QTFD_design_paper.pdf

Aim 7: Project Management and Coordination

Start Month: 1 **End Month:** 36 **Completed?** No **Completed Percentage:** 80%

Tasks associated with this aim for this period as per the original proposal:

(1) Provide guidance for the research team, (2) Ensure quality administrative and financial management of the project; (3) Develop a spirit of co-operation between the partners;(4)Ensure consensus management and information circulation among the partners; (5)Coordinate and control project activities to keep it within the objectives

Have you experienced any difficulties?: Yes

An ethics issue occurred and hindered the project progress.

Progress made, accomplishments achieved, and plans to tackle the difficulties listed above (if any):

Prof Boashash is effectively supervising the activities in the project both at the Qatar University and the University of Queensland, Brisbane Australia. The two research groups (one in Qatar University and the other in the University of Queensland, Australia) are working in close coordination to achieve satisfactory results. The effective supervision and close collaboration has led to publication of "Automatic signal abnormality detection using time-frequency features and machine learning: A newborn EEG seizure case study" in the journal of "Knowledge-Based Systems". In addition, two other papers have been submitted to the IEEE Transactions on Signal Processing journal under review (as described in previous Aims). Prof Colditz has assigned additional time to the tasks of data construction and connectivity analysis. He is also liaising with the developer to solve the technical issue in head modeling. The main issue that arose in the last 6 months period was unauthorized publications (attached) by former Postdocs which led to the termination of Dr Sadiq's employment by the University of Queensland (Dr Sadiq was scheduled to transfer from the Qatar University team to the Queensland University team to improve efficiency in the collaboration). This resulted in a waste of 6 months efforts and damaged plans to prepare and submit a patent on the work done. In the grace period, the team leaders managed to catch up to a more reasonable timeline by leading the development of a realistic head model and relevant methods which has been just completed. Substantial progress has been made toward Aims 3 & 4 and the study of Aim 5 has been initiated. In addition, a qualified post-doc is being recruited to join the Australian team and paperwork is undertaken to complete the appointment. Furthermore, Dr.

Hichem Barki has been appointed in the Qatar team. We also anticipate that we may also lodge at a later date a request for extension depending on overall progress.

Supporting Documents

- Knowledge-Based_Systems.pdf
- Unauthorized_publication_1.pdf
- unauthorized_publication_2.pdf

Future Plan

Aim 1: EEG Data acquisition, labelling, and pre-processing

Start Month
1

End Month
36

Tasks associated with this aim for the next reporting period
Complete the construction of the dataset that is built for EEG abnormality detection/classification and source localization, including accurately and appropriately sorting and labeling the data.

Aim 2: EEG Abnormality detection using multi-channel t-f signal analysis methods

Start Month
1

End Month
30

Tasks associated with this aim for the next reporting period
We plan to extend the work published in the Knowledge-Based System journal paper as follows: 1. Integrate the developed EEG abnormality classification methods based on multi-channel t-f signal analysis. 2. Test and validate the methodology using the complete dataset. 3. Testing several improvements of the published study, including: • Extension of the algorithm to more realistic situations, e.g.,

colored and non-stationary noise. • Development of the theory of the time-frequency and time-scale methods to find the relationships between the two kinds of approaches and to combine them. • Comparison in terms of classification performance between different feature selection algorithms and different classifiers. In addition, a study discussing channel variability in multichannel newborn EEG is progressing. For the second study proposing a new TF pattern recognition approach and more discriminating TF image features, future plans are summarized as: 1. Optimization of software for the computation of the different TF image features, including LBP TF image features. 2. Testing different machine learning cross-validation strategies. 3. Comparing classification performance and validating the results on big and complete data sets. 4. Investigation of modern deep learning techniques that automate feature engineering and which have been shown to outperform human/manual feature extraction and selection. As general improvements for the aforementioned works, we also plan to develop a friendly-interface accessible to users, from neophyte to experts, which allows testing the developed algorithms on new data.

Aim 3: Designing a head model for neonates

Start Month
1

End Month
12

Tasks associated with this aim for the next reporting period
Improve the automated MRI segmentation method to enhance the head modeling efficiency.

Aim 4: EEG source localization, and validation of the techniques developed

Start Month
13

End Month
36

Tasks associated with this aim for the next reporting period
Validate the results using realistically simulated EEG and real EEG data and the established head model for neonates. We propose an extension of TF-DOA estimation method to the case of circular or/and spherical array, as an intermediary step before their application to the EEG localization problem.

Aim 5: Connectivity analysis for EEG abnormality characterization at both scalps and source levels

Start Month
19

End Month

30

Tasks associated with this aim for the next reporting period
We will continue theoretical development of connectivity analysis methods as well as exploration of connectivity analysis at the source level based on the localized sources. However, given the delayed progress on newborn head modeling and difficulty of finding a suitable post-doc, an extension for completion of the project may be requested so as to finalize this aim perfectly.

Aim 6: Design of new Time-Frequency Signal Processing methods including theory, algorithms and implementati
Start Month
1

End Month
36

Tasks associated with this aim for the next reporting period
1. Integrate the already developed time-frequency analysis methods that best represent neonatal EEG signals, and construct a comprehensive classification system that can identify different classes of EEG signals including seizure burst and suppression as well as normal background and artifacts; 2. Improve the effectiveness of the developed time-frequency methods by optimizing the codes and algorithms. 3. Validate the automatic setting of MDD parameters for more real data and try to add a test to make this step more robust. 4. Extend the model of piece-wise linear FM to piece-wise hyperbolic FM in order to be more general. 5. Finalize the remaining supplementary material for the Time-Frequency Signal Analysis and Processing 2nd Edition book, so as to set up a standard library of time-frequency algorithms for improved efficiency.

Aim 7: Project Management and Coordination
Start Month
1

End Month
36

Tasks associated with this aim for the next reporting period
1. Provide guidance to the research team; 2. Coordinate the efforts at Qatar University and University of Queensland; 3. Control project activities to keep it within the objectives; 4. Organize regular meetings of the research team to ensure consensus management and information circulation among the research partners; 5, Ensure quality administrative and financial management of the project; and 6. Ensure timely, high impact and effective research outputs in the form of book, articles and conferences.

Collaborator Contributions

#	Team Member	Role	Contributions
1	Prof. Boualem Boashash	Lead PI/ Co-Lead PI	1) As a project manager, I have continued to manage the grant as efficiently as possible in a difficult situation due to difficulties faced with personnel recruitment issues. The main issue we faced is that an agreement was reached to transfer the postdoc working on the project in Qatar to the Queensland university site; this is so that he can implement some of the theoretical algorithms developed in Qatar directly on the medical data on the medical site. I had then to liaise with the PI in Australia so as to organize a new job offer for him based in Queensland university. Unfortunately, after a new job offer was issued by Queensland university to him and visa processing was initiated, we realized that he had been sending research results from the project for publication without authorization and without the knowledge of the PIs, and also using an inappropriate affiliation while still acknowledging the grant. This led to the withdrawal of the job offer from Queensland university and the subsequent loss of a postdoc for a period of more than 6 months. I had to manage this situation, not knowing for a long time if he will continue to work on the project or not. There were similarly delays in trying to appoint a replacement due to other visa issues. As a consequence of the above personnel issues, I spent more personal time doing the work myself, despite my high teaching load, and we were able to still progress the project enough to show a significant potential for success once we are able to make the necessary appointments. 2) In terms of technical contribution, I have reviewed the protocol for collecting data and sent improved specifications for the new data collection, so that there is a more precise labeling of the signals and channels so as to allow the use of localization algorithms. I have written and submitted several papers for publication on several technical topics related to the relevant aims of the project. I took the lead in most of these papers.

2	Prof. Paul Colditz	PI	I have continued with data annotation and furthering the analysis of the sensory neural responses to stimulus to the baby's hand in EEG signals. Specifically there has been a need to identify the types of artefact and in particular sort out those with a basis in recording conditions that should be amenable to improvement in the recording environment if identified as such, and those with a physiological basis such as movement, muscle activity etc and to ensure appropriate identification of the sensory stimulation data in the EEG. This has been achieved both independently and by me also working in liaison with the paediatric neurologist, Dr Shabeed Chalakadan at the Lady Cilento Children's Hospital in Brisbane. In addition I have needed to take on a greater role in the tasks of data construction and connectivity analysis and spent time dealing with technical issues in head modelling. This has been necessitated by our difficulty of finding a suitable RA, as described elsewhere in the report. Again, necessitated by the difficulty in finding suitable RA, I have taken a greater role in the collection and labelling of newborn EEG for validating EEG abnormality detection/classification as well as source localization. In the EEG data collected, we have identified cutaneous stimulation EEG responses at 1Hz corresponding to the stimulus period. Since the sensory cortex relating to hand stimulation has been well characterised, this dataset is important for validating the proposed source localization methods. I continue to have a close role in specific elements of multichannel newborn EEG data analysis as well as general management of the project at the University of Queensland. I have assisted the lead PI to effectively deal with unanticipated RA shortages to insure continued productivity within the project. I've also needed to work with the PI to ensure satisfactory progress of the project by additional involvement in the project management particularly at the Brisbane site.

Research Training

Have you recruited any Research Team Member or Unnamed Consultant? Yes

Remarks:

#	Unnamed Role	Participant Name	Email	Affiliation	Location	Gender	Contribution

1	Research Assistant-2	Mr. Mohamed Al-Sa'd	alsad.mohamed@gmail.com	Qatar University	Inside	Male	Verification, update and extension of code for time-frequency algorithms.
2	Post Doctoral Fellow-1	Dr. Hichem Barki	hbarki@qu.edu.qa	Qatar University	Inside	Male	1) Extension and refinement of abnormality detection and classification methods; 2) development of new techniques and algorithms for feature extraction.

Research Outcomes

Has your research project generated publications during the funding period covered by this progress report (excluding 'accepted', 'forthcoming' and 'submitted' papers)? Yes

Publication Type	Title	Authors	Reference No	Abstract	Document
Journal Paper	Automatic signal abnormality detection using time-frequency features and machine learning: A newborn EEG seizure case study	Prof. Boualem Boashash	ISSN:09507051	Time-frequency (TF) based machine learning methodo... more	File

Potential IP

1. Has your research resulted in a new process, technique, composition of matter, device, software, database, new use or improvement to an existing process?

Answer

No

Comments

N/A

2. Have you previously disclosed your research results through a presentation or publication? Do you intend to disclose your research results in the next 6 months in the absence of an NDA, for example, through a conference presentation or journal publication? Please provide details
Answer
Yes

Comments
Yes; a number of papers have been submitted, including unfortunately 2 unauthorized publications by former Postdoc Sadiq Ali as reported in Aim 7.

3. Have you previously filed an invention disclosure within the scope of this research grant?
Answer
No

Comments
N/A

4. Do you intend to file any invention disclosures within the scope of this research project?
Answer
No

Comments
N/A

5. Has a patent application been filed under the research project? If yes, when, where, and by whom was the application filed?
Answer
No

Comments
N/A

6. What is the stage of development (pre-prototype, prototype tested, untested prototype)? How much more technical development is required in terms of time and investment needed to achieve? Please indicate the Technology Readiness Level, see here
Answer
N/A

Comments
The stage of development is pre-prototype. The Technology Readiness Level is TRL 1.

7. To whom do you need to report project IP? What is your understanding of the ownership of the IP?
Answer
N/A

Comments
I need to report project IP to the Office of Research at Qatar University. My understanding is that IP is owned jointly by the PIs and Qatar University.

8. Have any individuals/consultants participated in the research project? If yes, please specify details of the individual (period of collaboration, institution). Was this arranged formally through the relevant Technology Transfer Office?
Answer
Yes

Comments
A consultant was appointed; his name is: Dr Abdeljalil Aissa elbey. That was from 20th May to 31st May 2016. He is from the university of Telecom=Bretagne, Brest Cedex 3, France. Yes; he was appointed through the Office of Research. His visit was at no cost to QNRF as he was passing by on transit through Qatar.

9. Do you believe your project would benefit from an assessment of the technology asset portfolio developed and the potential market opportunity?
Answer
No

Comments
N/A

Equipment

Equipment Name	Quantity	Serial Number	Location	Purpose	

No records available

Travel

From Origin to Destination(s)	Start Date	End Date	Traveler(s) Name(s)	Purpose	
From Qatar to Brisbane, Australia.	18-Aug-2016 12:00 AM	25-Aug-2016 12:00 AM	Prof Boualem Boashash	1) Review all technical progress and management issues. 2) Discuss the difficulties encountered in the project and agree on solutions. 3) Plan for the next stage. Note: This was an INFORMAL trip at no cost to QNRF.	

Appendices

Expenditure Report

Inside Effort Days	Outside Effort Days	Equipment Cost	Personnel Cost	Travel Cost	Miscellaneous Cost	Indirect Cost	Outside Cost %	Remarks
143	50	$0.00	$31,886.00	$0.00	$0.00	$4,782.00	45	

Report Status History

Date	Version	Status	Action By	Remarks
15-Aug-2016	1	Submitted	Prof. Boualem Boashash	Submitted by Lead
25-Aug-2016	1	RO Vetted	Miss Reem Lataifeh	Vetted by RO
31-Aug-2016	1	In Grace Period	Mr. Anhi Hong	Allowed Grace Period of 3 Months by QNRF
30-Nov-2016	2	Submitted	Prof. Boualem Boashash	Submitted by Lead
01-Dec-2016	2	RO Vetted	Mrs. Maysoon Gharzeddine	Vetted by RO

29-Dec-2016	2	QNRF Returned to RO	Mr. Anhi Hong	Dear RO, The MoPH IRB Research Assurance letter for Queensland University should be uploaded in Q-Grants, SCH documents section. All institutions conducting research that engage human subjects must have an valid approved assurance from MoPH. Please resubmit your report once completed
04-Jan-2017	4	RO Vetted	Mrs. Abeer Raie	Vetted by RO
15-Jan-2017	4	QNRF Accepted	Ms. Buthaina Al Hashmi	QNRF Accepted by QNRF

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