Reviewer’s report

Title: Analyzing repeated data collected by cell phones and frequent text messages. An example of Low Back Pain measured weekly for 18 weeks.

Version: 2 Date: 5 March 2012

Reviewer: Anthony Staines

Reviewer’s report:

General comments

This is an interesting paper on an important topic. I think it tries to cover too much ground, and flips from lengthy exposition of the very simple, to dense and brief exposition of very complex ideas. I do not think it publishable as it stands, but a more focussed paper on the multi-level model piece might be very useful indeed. It needs a little language editing for clarity, some of which I have covered here.

Main points

Abstract

I would add “and the between measurement occasion correlation” to the list of vital issues to consider. Interpreting complex outcome measures in a clinically meaningful way is, of course, most important, but has nothing in particular to do with repeated measures.

Is Hazard regression the same thing as proportional hazards regression (Cox 1972) – if so please use the familiar term.

I think you will find that GEE usually stands for ‘Generalised Estimating Equations’ not ‘Generalised Estimation Equations’. I know the gee software uses the second version, but it is very much in the minority.

What are 'Frequent measures'?

Background

What has EMA got to do with seasonal variation – I don't see any obvious link.

'The data are accessible by the researcher’ not ‘to the researcher'

You mention 'previous studies have shown compliance to be high' and then cite only one – ref 4. Are there more? 'The method has shown good user friendliness' is awkward 'The method is very acceptable to users' might be better.

Which two of the 'referenced studies' produced the data – I suggest a reference!

Methods

It would be useful to say how big each study was.

'supervised' and 'unsupervised' – I've never come across this use of the two
words before. There is a quite different, and common use in the machine learning
and classification literature. In any event I still don’t understand it after reading
your definitions. Please explain a lot more fully.

The phrasing of ‘inherent covariance’ is wrong – you mean either or both of
within-subject or between-occasion covariance, which are the two sources of
non-independence in this type of data. Any data set with more than one variable
has a between-variable covariance. I would talk about lack of independence
instead, as it is a clearer concept.

The location of a confidence interval is an unfamiliar idea to me – what do you
mean?

Research questions

1 How many days with pain do patients experience?
   This is awfully elementary.

2: What is the proportion of participants “recovered” at different time points?
'To describe the variance of the population' - do you mean the variability within
person, or between persons? The variance is not either of these. Given your
comment about multiple testing, you do realise that testing for a defined
outcome, after graphing the data, poses exactly the same problem? You must
fully pre-define your outcome of interest.

B: Incidence of recovery at a prespecified time point, Table 1.
Hazard rates are the ratio of instantaneous failure rates in survival analysis, an
are conceptually distinct from both odds ratios and relative risks. Please say how
you calculated the relative risk from the odds ratios.

3: What is the time to recovery?
“to study incidence of an event over time” ought to be “to study the incidence of
an event over time”

For the spline regression – what is the evidence that there is a statistically
significant difference between the locations of the two knots in the two groups?

There is a large and well developed literature on using survival analysis with
fluctuating conditions, where the event of interest can occur more than once.

“as included poor compliers only marginally “ ought to read “as including poor
compliers only marginally”

4: How is the repeatedly measured data associated with baseline (predictor)
variables?
Please explain, much more fully, 'fixed effect' this is meant to be an elementary
introduction.

The explanation here is very unsatisfactory – I'm quite familiar with these
methods, and I don't understand what you are trying to say. Going from a long
description of a t-test to this highly condensed description of very tough methods
is not a runner. GEEs estimate marginal models – again you need to explain what these are. You don't discuss random effects at all, that I can see. What does IRR stand for?
How, exactly, do you model a covariance structure?
You speak several times about 'standard statistical software' What do you mean? Both R and Stata (I think) implement all of these methods.

5: Are there subgroups of patients with similar courses of pain within the studied population?
In my experience all of this makes more sense if you show the cluster graphs, dendrograms etc...

Please use one term consistently – I suggest 'repeated measures data' as it is the common jargon.

Level of interest: An article whose findings are important to those with closely related research interests

Quality of written English: Needs some language corrections before being published

Statistical review: Yes, and I have assessed the statistics in my report.

Declaration of competing interests:

I am the lead author on a manuscript which seeks to introduce people working in the field of biomechanics to multi-level modelling. This has not yet been submitted for publication, but it does cover some of the same ground as this paper.