Development of an online results portal for laboratory results during Laboratory Information System (LIS) downtime

DJ van der Westhuizen[1], HW Vreede[1]

1. Division of Chemical Pathology, University of Cape Town & Groote Schuur Hospital, National Health Laboratory Services (NHLS), Cape Town, South Africa

Introduction

Downtime of the LIS (TrakCare) or the external results access application (TrakCare Webview) disrupts the reporting of laboratory results. In South Africa, the NHLS still relies on paper-based or phone-based reporting methods during these downtime events.

Background

No alternative online results portal is available during these downtimes. Results reporting during these downtimes becomes extremely difficult in our high-throughput routine laboratory as phone lines become flooded and laboratory staff overwhelmed by clinicians requiring results. There are to our knowledge no web-based reporting systems available to provide laboratory results to clinicians when the usual LIS is unavailable.

Objectives

During an unplanned lengthy web results portal downtime, the following objective was formulated:
- An online web-based results portal is needed to report laboratory results during scheduled or unforeseen LIS downtime.
- Clinicians need to be able to access results from their mobile phones as well as from a computer, using a 'responsive' web site thus obviating the need for an app.
- The platform needs to be inexpensive.
- There needs to be a mechanism to access or load recent/current NHLS results data.

WordPress (figure 1), an open source web server-based content management system initially used for blogging, might be used to develop a website to make patient results available online during laboratory downtimes. WordPress is user-friendly, with various freeware plugins which can be installed to tailor a web site for one's specific needs.
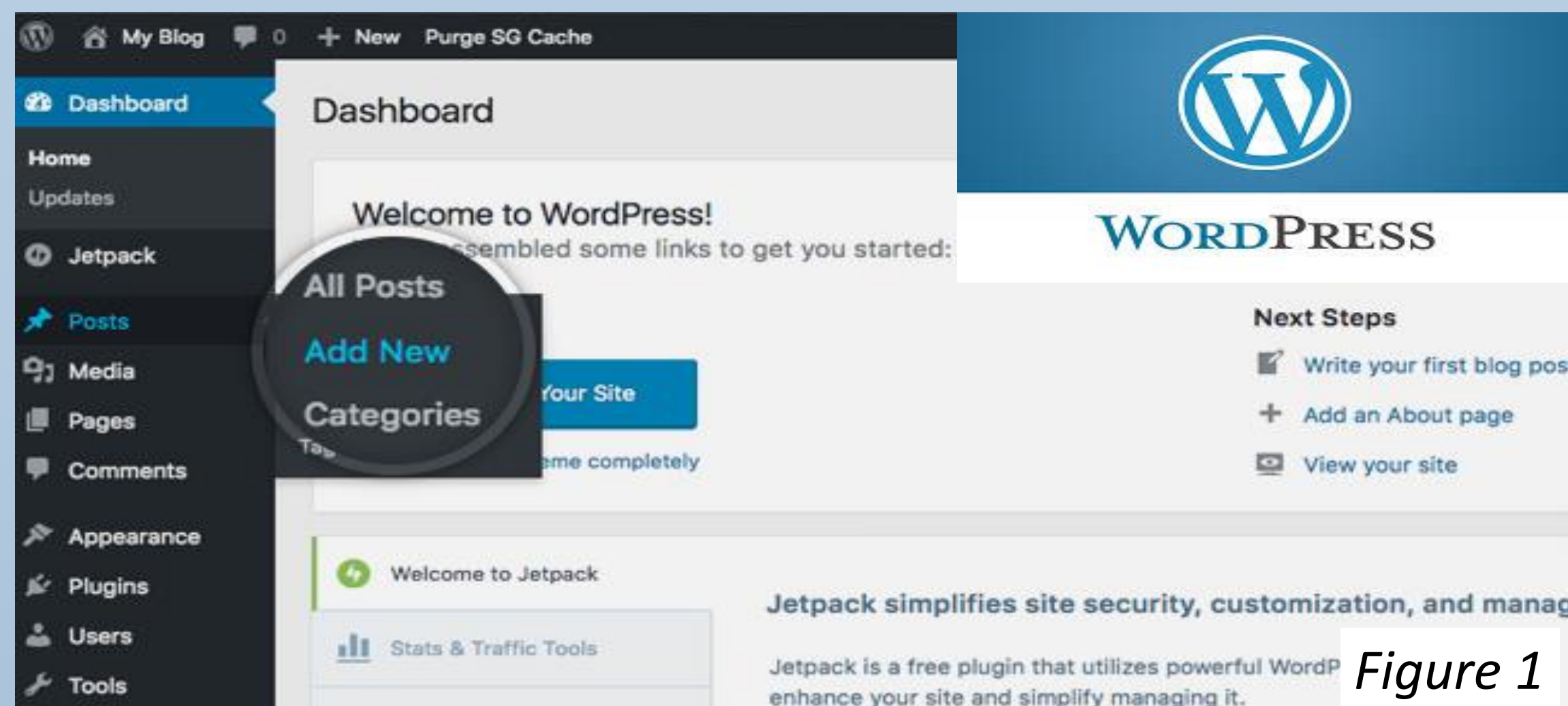

Figure 1

Methods

As proof-of-concept, the following was done:
1. A shared hosting account was created at a local web hosting company, Elitehost, at a setup cost of R99 for the domain registration and R35 p.m. for unlimited hosting space and bandwidth (figure 2).
2. WordPress was installed on the hosting server.
3. To manage security on the site, a highly rated free security plugin was installed and configured (figure 3).
4. To manage user access to results, an access restriction and user registration plugin was installed (figure 4). This plugin notifies a pre-configured admin email address for each new registration on the web site and holds new registrations for admin approval.
5. To automatically present patient results in a table format, a commercial table generator plugin was used (figure 5).
6. To import patient results in CSV format to the web site's SQL database, a commercial import plugin was used (figure 6).
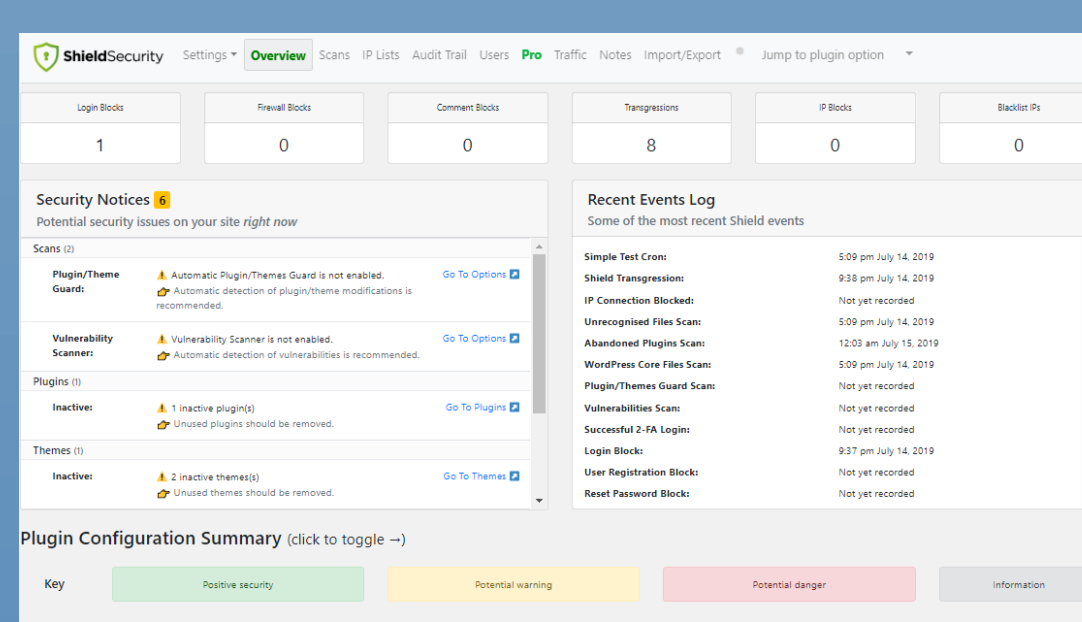

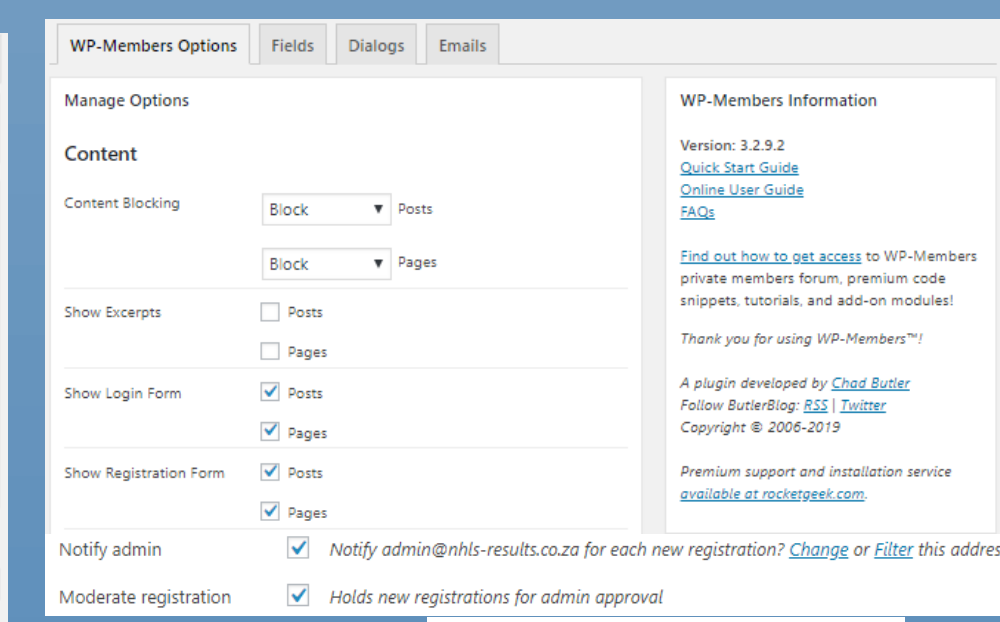*Figure 2 – Hosting registration*

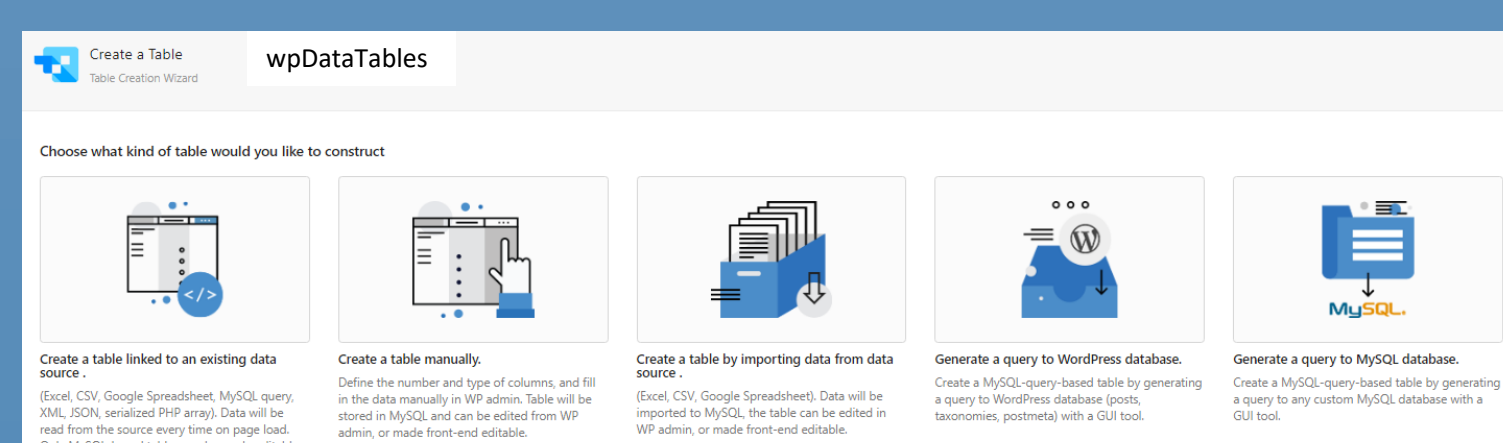*Figure 3 – Security Plugin*

Figure 4 – User authorization

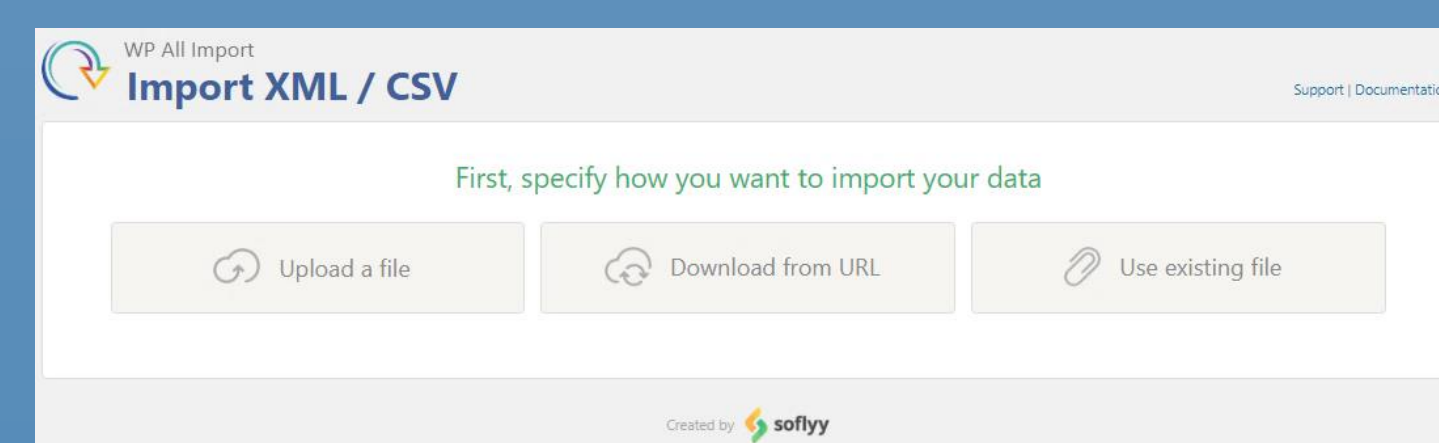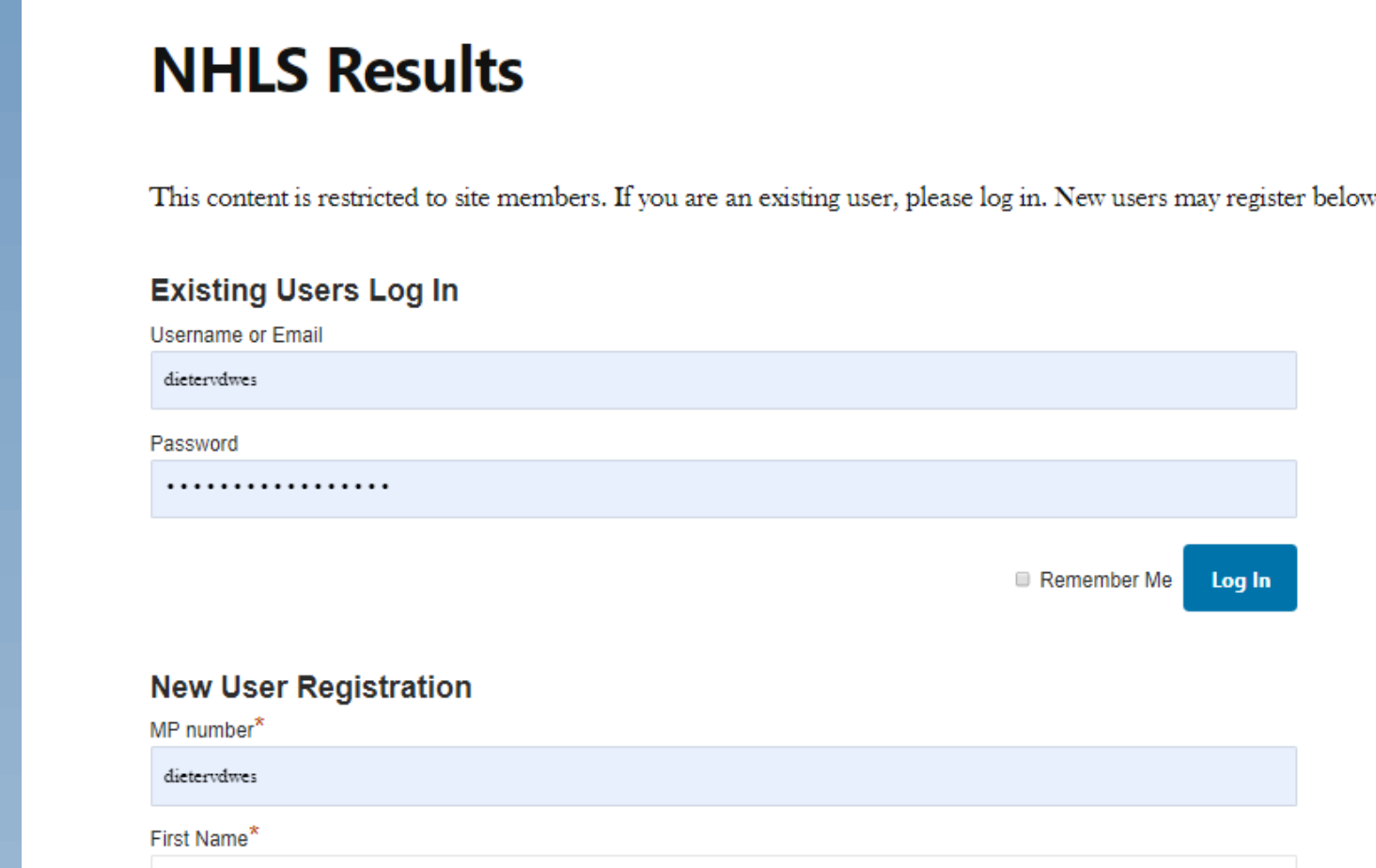*Figure 5 – Table generating plugin*

Figure 6 – Data import plugin

Results

A simple website with a high level of security is available on which urgent results can be published in table format. [1]
Administrator privileges (for portal and importing of patient results can easily be automated. Authorising user registration is done via an online admin portal (the back-end of WordPress).

Recent results were extracted from the LIS, and loaded to the web page. Data can be loaded from CSV or Excel files or by linking an SQL database to the web page. This takes more time than automated result transmission.
Users entitled for results viewing, can be registered by one of the administrators on the admin portal of the web site or they can register themselves, after which registration will subsequently be authorized by an administrator. The authorization of self-registered users (subscribers) on the web site by administrators, is to limit access to known HPCSA registration numbers (entitled clinicians) which can be confirmed on the HPCSA clinician web site, HPCSA Iregister.[2]
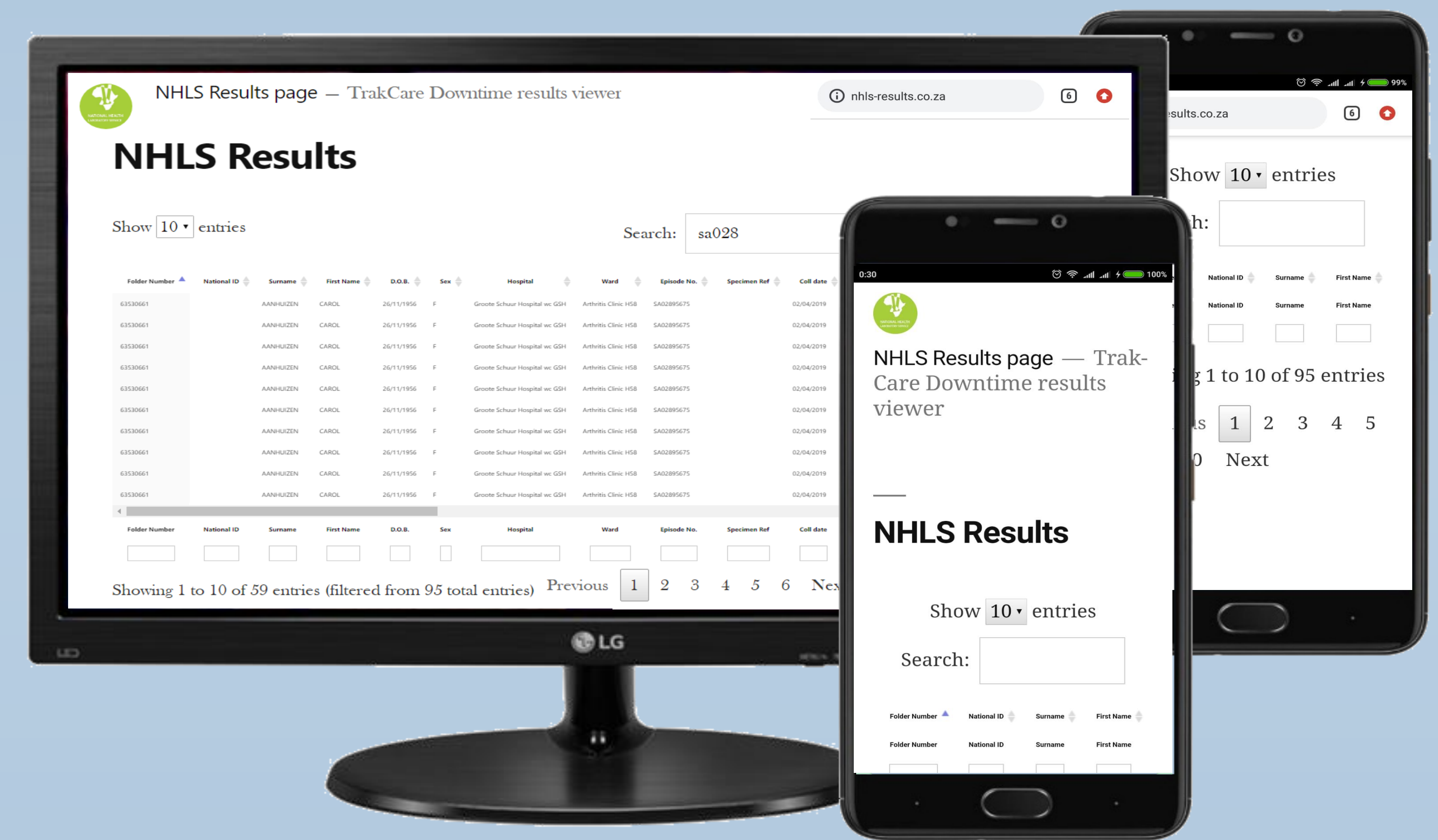
Discussion and Conclusion

The results web site was successfully installed and configured in about 5-6 hours during a prolonged unplanned web results portal downtime.

Difficulties experienced:
- Prior to access restriction for unregistered clinical users, a concern was raised regarding patient confidentiality. This was corrected by implementing the access restriction plugin as in point 4, *Methods.*
- WordPress web sites generally have a 32-128mb file upload limit, depending on server size, which can limit the upload quantity of laboratory results. It can be overcome by using an FTP (file transfer protocol) file server client for uploads.
- With >5000 results in the database, there were significant time delay in search queries. A possible way to eliminate this problem, is to write a custom SQL query for a specific search box to initiate a 'server-side'-processing before displaying the results of the search on the web site. This obviates the need for the browser to download the whole database file to memory before it is displayed, and only the generated results from the query can be displayed. This optimization still needs to be done.
- This system has not been tested when more than 2 or 3 users are accessing the database simultaneously. This might result in slow search query processing. It will need to be tested in a bigger, real-life scenario. A server with a higher processing power might obviate this problem. Another work-around to a slow database processing time, is a custom search query script, which will need technical assistance from a programmer.

Implementing innovative information technology and open source software, it is possible to design ways to solve real world problems while optimising patient care during downtimes.

References

[1] Van der Westhuizen, DJ 2018, NHLS Downtime Results Viewer, viewed 15 July 2019, <http://nhls-results.co.za>.
[2] HPCSA 2019, HPCSA Iregister, viewed 14 July 2019, <http://isystems.hpcsa.co.za/iregister>.