

## Summary of the literature on “Tools” to support the prioritisation of individual patients for clinical review by the acute sector pharmacy team

Patient complexity and throughput in acute care have increased over recent years; and pharmacy resources have often remained static or reduced. Targeting resources and skills to those patients in most need of a clinical pharmacist’s expertise, and guiding junior pharmacists in their work are therefore important. This literature review aims to help Clinical Pharmacy Managers who wish to develop a tool to support the implementation of a clinical prioritisation strategy. It will also provide ideas for those who are exploring what a local strategy could include.

Developing a “clinical prioritisation tool” is challenging; and identifying which factors predict those at most risk of harm must be balanced against potentially targeting virtually all patients. A tool needs to be practical and easy to use. The ability of electronic prescribing systems to manipulate differing data sources may help.

This resource contains published and/or presented tools from the UK, New Zealand and Australia (because of similar models of clinical pharmacy) from 2012 to the start of 2019, including attempts to validate and/or measure the impact of a tool assessing risk as well as workflow. 2012 was chosen as a start date because the example by Cottrell et al (see page 2) was the first to explore prioritisation for **individual** patients. Material is presented chronologically rather than thematically.

This resource is divided into two sections: Part A identifies where prioritisation tools are in use, and Part B describes where either the tools are under development or evidence is provided to support the development of a tool locally. The full literature review is not included in this document because of its length. Please contact the Medicines Use and Safety team if you would like further information at . [LNWH-tr.MUS-SpecialistPharmacyService@nhs.net](mailto:LNWH-tr.MUS-SpecialistPharmacyService@nhs.net).

The authors are aware of unpublished tools in use or under development. Collaboration across a geography, such as a Sustainability and Transformation Programme (STP) footprint, an e-prescribing support network or region may reduce the development burden but could increase the complexities of reaching a consensus.

The University of Manchester are currently using published evidence and national consensus to develop patient-centred pharmaceutical complexity tools to prioritise patients for a pharmacist’s care. Work at the Luton and Dunstable Hospital has been attempting to assess the impact of potential risk factors on preventable medication related problems on patients in medical wards. Both pieces of work are anticipated to contribute to practical tools that make a difference to patients.

## Part A - Clinical prioritisation tools in use – in chronological order

Authors	Brief description of tool	Outputs/Outcomes	What this tool/report adds
Richard Cottrell et al., Ayrshire and Arran Health Board 2013 <sup>1,2</sup>	Traffic light system to rank all inpatients as High Risk (red), Moderate Risk (amber) Low Risk (green) from a number of risk factors which were agreed by consensus are described in the paper.	In use since 2010 following a Serious Untoward Incident. Use of the JAC Electronic Prescribing System since 2000 facilitated its development and introduction as needed to assign scores.	First publication on a clinical prioritisation tool for individual patients in the UK.
NHS Greater Glasgow and Clyde 2014 <sup>3</sup>	Similar traffic light system to the Ayrshire and Arran Health Board.	Details of the traffic light system were not reported in the paper which is a newsletter to NHS Glasgow and Clyde staff.	Another Scottish adaptation of a traffic light system
Wheelan et al., Glasgow Royal Infirmary 2014 <sup>4</sup>	Adapted a pre-existing tool for use on a rehabilitation and assessment directorate.	Application of the tool on day 1 or 2 of admission reliably identified patients with the greatest number of pharmaceutical care issues.	A tool for a specific directorate.
Nazanin Falconer et al. (New Zealand) 2014 and 2017 <sup>5,6</sup>	ART – ‘At Risk Tool’. An electronic prioritisation tool for clinical pharmacists to target medicines reconciliation on admission, developed on medical wards. Electronic – so data can be captured in real time. Consensus developed risk scoring from 38 factors or flags [5 from patient profile, 7 from patient encounter, 4 from clinical profile (particularly patients with chronic disease), 9 from high risk medicines and 13 from laboratory values]. NZ has a national database EPIFANY for recording interventions which was a helpful starting point.	Has been in use since October 2011. The 2014 articles cover how the tool was introduced. The 2017 prospective observational study showed the high risk patient group had significantly greater number of unintentional discrepancies than medium and low risk groups. 25 flags were significantly associated with the risk of unintentional medication discrepancies and prescribing errors. Particularly more than 8 admission medicines and readmission within 30 days of discharge. Improved clinical pharmacist workflow (although other changes like decentralisation of service may have impacted) and potentially patient outcomes.	A well-established tool from a country with similar clinical pharmacy practices to the UK. Validation of the tool published and concluded that ART was effective for prioritising patients for interventions such as medicines reconciliation.

Authors	Brief description of tool	Outputs/Outcomes	What this tool/report adds
Ryan Hickson, Steve Williams et al. South Manchester University Hospital 2016 <sup>7</sup>	PAST – Pharmaceutical Screening Assessment Tool (to measure patient acuity and prioritise pharmaceutical care) for medical and surgical patients. Tool developed by consensus – aiming to prioritise departmental workflow for clinical pharmacists. In use since 2014, the Patient Acuity Level (PAL) is recorded on the ward’s electronic patient summary board. Prescriptions and notes were hand written but laboratory data was electronic (full electronic patient records would make the process easier) Patients assigned one of three PALs) High PAL level –seen by more experienced pharmacist. Details in the paper.	After 6 months a quasi-experimental service evaluation of pharmacist documented (PAL) and that expected from PAL guidance. 20 (57%) documented PALs matched the PAL guidance. 7 of 9 patients overvalued (over scored) by the pharmacist had no high risk medicines or organ dysfunction. 4 of 6 patients undervalued (underscored) by the pharmacist had Cystic Fibrosis which automatically puts the patient into the highest category. ICU patients automatically fell into High PAL category.	In depth description of the development and content of the PAST, a non-validated tool.
Katherine Saxby et al. South Manchester University Hospital 2017 <sup>8</sup>	Pharmacists’ attitudes towards the pharmaceutical assessment screening tool described above.	28/32 pharmacists completed the questionnaire of applying PALs to 6 theoretical patient cases. Mean confidence for assigning PAL was 81%. 26 (93%) agreed or strongly agreed professional judgement guided them most when allocating a PAL. PALs were over and under assigned but the overall strength of agreement was considered fair.	Concluded that professional judgement overrides using PAST.

<b>Authors</b>	<b>Brief description of tool</b>	<b>Outputs/Outcomes</b>	<b>What this tool/report adds</b>
Raliat Onatade et al., Barts Health 2018 <sup>9</sup>	The team from Barts Health adapted the PAST tool <sup>7</sup> for use locally by junior pharmacists to assign a PAL (Patient Acuity Level). Ward pharmacists used the tool during daily clinical work. A senior pharmacist independently assigned PALs to patients seen by 4 juniors. Types of wards included not specified. The adapted tool is available to share.	217 patient encounters for 122 patients were assessed. Percentage agreement between Senior and Ward Pharmacists was 81% (range 62% - 88%). Overall Cohen's Kappa was 0.59, moderate agreement (range 0.38 – 0.60). For 11.5% encounters, the SP allocated a higher PAL than the WP. For 7.8% encounters, the SP allocated a lower PAL. Every day, 45 to 60 minutes per 25 beds could be saved by not seeing patients assigned the lowest PAL score daily. Assigning PALs using the tool was straightforward and feasible.	Adaptation of an existing tool can save development time. The Barts team reported effective use of the tool can lead to time efficiency savings. Pharmacists' sometimes used their clinical judgement to override the PAL indicated by the tool. The safety implications of junior pharmacists assigning lower PALs than might be expected needs to be assessed.
Robertshawe et al., Christchurch women's hospital, New Zealand 2018 <sup>10</sup>	Aiming to decrease the time taken by clinical pharmacists to identify and prioritise obstetric patients in need of medicines reconciliation. Recorded time taken for manual prioritisation compared to a newly introduced electronic system.	Time taken for 84 patients fell from 159 minutes/week to approximately 10 minutes. Releasing pharmacists time and a potential cost saving.	There is interest in prioritising patients other than adults admitted to medical areas This NZ study demonstrated an electronic system is quicker.

## Part B - Research for content of tools and tools under development - in chronological order

Authors	Brief description of research	Outcomes/Outputs	What this research adds
El Hajji et al., Queen's University, Belfast 2015 <sup>11</sup>	This group developed predictive algorithms for harm e.g. risk of mortality, risk of mortality post discharge and risk of readmission in a cohort of patients receiving an Integrated Medicines Management Service.	They were not able to develop an algorithm for the risk of longer hospital stay than expected from the sample data they had. The algorithms were not reported to be in use clinically.	Identified predictive harm. Adds to the evidence base. Worth looking out for anyone adopting in practice.
JR Cowey, J Grant, AB Mullen NHS Greater Glasgow 2015 <sup>12</sup>	A triage tool for obstetrics patients was developed from a retrospective chart review. Women were classified as high (red) or green (low) risk.	Missed opportunities for pharmacist's input were higher in the red group of women.	The triage tool identified higher risk patients. At the time of publication the tool was not in routine use.
Emma Suggett et al., Birmingham 2016 <sup>13</sup>	As part of a PhD and prior to introducing a prioritisation tool in Birmingham, the authors undertook a systematic review of the literature looking for measurable risk factors for medication-related issues and high risk drugs.	From 38 papers the 10 most reported measurable risk factors for medication-related issues were identified (all identifiable from hospital inpatient records). High risk drugs, polypharmacy, age, renal function, gender, comorbidities, length of stay, history of allergy and compliance issues, liver function.  28 of the 38 papers identified the most frequently reported drugs or classes of drug associated with medication-related issues Antimicrobials, thrombolytics/anticoagulants, CV, CNS, diuretics, corticosteroids, Chemotherapy, opiates, anti-epileptics, insulin/hypoglycaemics, anti-inflammatory/NSAIDs.	Useful overview of risk factors. However the authors reported that no papers discussed the risk factors with the requirement for a pharmacist intervention. It was identified that further work was required to quantify the risks from the high risk drugs.

Authors	Brief description of research	Outcomes/Outputs	What this research adds
<p>NHS England, Transformation of seven day clinical pharmacy services in acute hospitals, 2016<sup>14</sup></p>	<p>As part of developing the report for NHS England on Transforming seven day clinical pharmacy services in acute hospitals. A workshop was held which produced 10 Design Principles for Pharmacy Clinical Triage for Acute Hospitals.</p>	<p>The 10 design principles were proposed by practitioners with experience of introducing clinical prioritisation and can be found on page 30 of the seven day working report along with a number of case reports.</p>	<p>Useful principles to consider when developing a prioritisation tool.</p>
<p>Jeon et al., using ASHP members 2017<sup>15</sup></p>	<p>A study to identify and characterise preventable adverse drug events for prioritising pharmacist intervention in hospitals – a list of 21 preventable adverse drug events was developed from published epidemiological studies and disseminated to ASHP members and a national technical expert panel to evaluate the importance, prevalence, preventability and measurability.</p>	<p>179 ranked responses were received and they confirmed that all the preventable adverse drug events were clinically important focus areas for pharmacist medication management. Expected degree of patient harm was the driving factor when respondents evaluated importance of the adverse events.</p>	<p>This US work is part of a larger effort to develop an electronic health record based prediction model (complexity score) that ranks hospitalised patients according to their risk of an adverse drug event.</p>
<p>Cathy Geeson Luton and Dunstable<sup>16-20</sup></p>	<p>As part of PhD work supported by a NIHR Grant, Geeson is developing a tool called MOAT (Medicines Optimisation Assessment Tool) to identify patients at highest risk of medication-related-problems, by drawing on her experience as a Clinical Pharmacy Services Manager and contacts in practice.</p> <p>Geeson spoke about her work at a 2016 SPS Network meeting.<sup>19</sup></p>	<p>A survey of healthcare professionals and patient/public representatives ranked potential prognostic factors (PFs) identified from the literature. 23 of 27 PFs were considered important or very important and an additional 59 factors were suggested. Geeson collected data on medication related problems from 1500 patients on medical wards in two UK hospitals. Multivariable logistic regression models were used to determine the relationships between potential risk factors and preventable medication related problems that are at least moderate in severity. An internally validated prognostic model has been developed, which requires external validation.</p>	<p>Anticipating a practical embedded-in- practice tool, once externally validated. There may also be opportunities to participate in piloting.</p>

Authors	Brief description of research	Outcomes/Outputs	What this research adds
Penny Lewis University of Manchester <sup>21-22</sup>	In 2017 Penny Lewis attended an SPS Network meeting to describe progress with a NIHR funded research project to develop a patient-centred pharmaceutical complexity tool to prioritise patients for pharmaceutical care. Lewis invited attendees and MUS Network members to participate as experts in a Delphi study to develop the tool.	The group have conducted a systematic review of published tools <sup>23</sup> , and undertaken a national survey of NHS Trusts to investigate current practice <sup>21</sup> . This data and evidence was used in an international consensus study from which two paper based tools were developed, one to prioritise medical patients for medicines reconciliation and one to prioritise patients at medicines reconciliation or after subsequent pharmacist input.	They are at the feasibility stage and will be testing the tools in the near future. <i>(personal communication)</i>  Anticipated to be the first nationally developed clinical prioritisation tool. Look out for the launch of this tool.
Abuzour, Penny Lewis et al., University of Manchester 2018 <sup>23</sup>	Descriptive Study exploring the use of pharmaceutical care acuity tools in UK Hospitals - NHS Chief Pharmacists were invited to participate in a national survey on whether and what mechanisms had been adopted for prioritising patients.	78 of 169 acute trusts responded and 36 follow- up interviews were conducted. Preliminary findings were that current tools were often a combination of pharmacy service prioritisation (e.g. identifying those in need of medicines reconciliation) and patient acuity (based on the complexity of their condition and medication use). Benefits included instilling confidence that high risk patients would not be missed. Disadvantages included the sensitivity of the acuity tools where high risk medicines were commonly used, concerns about not seeing a patient selected as a priority due to staff shortage or lack of time and deskilling of junior pharmacists if high acuity patients were assigned to experienced pharmacists.	Useful background of what is happening in NHS acute hospitals for others developing or thinking of developing a tool.
Alshakrah, Penny Lewis et al., University of Manchester 2018 <sup>24</sup>	An extensive systematic review of Assessment Tools from around the world, tabulated to cover study aim, duration and size, type of tool developed, perceived benefits, limitations and whether validated.	Concluded that current tools were heterogeneous in content, targeting diverse patient groups and clinical settings. The underlying theme was that the tools appeared to achieve the aim of directing pharmaceutical care where it was most needed.	Useful background for others developing or thinking of developing a tool.

Authors	Brief description of research	Outcomes/Outputs	What this research adds
Tait et al., Paediatric conference publication, 2018 <sup>25</sup>	Consensus work across the Scottish Neonatal and Paediatric Pharmacists Group. Used an expert panel and a Delphi technique to review criteria-based statements from the literature.	18 criteria were identified for use in a triage tool and criteria identified for daily, 48 hourly or 72 hourly review. There is a plan to pilot the tool in clinical practice.	There is interest in assessing acuity for patients other than adults.
Nazanin Falconer et al., Brisbane Australia 2018 <sup>26</sup>	As part of a PhD, Nazanin ran focus groups to identify criteria and perspectives related to prioritisation. These were then used together with results from a literature search to develop an Australia-wide survey of what factors hospital pharmacists use to prioritise their patients.	The focus groups identified three themes – prioritisation criteria, barriers and facilitators of patient prioritisation. The survey identified the top ten criteria for prioritisation as renal impairment, therapeutic drug monitoring, high-risk medications, non-therapeutic INR/aPTT (for anticoagulants), high risk transfers, older age, out of range electrolytes, the number and type of comorbidities and a sub-therapeutic platelet count.  Falconer intends to identify an optimal combination of criteria that can be used in a practical manner at the bed-side.	Although the focus group participants were from one Australian state, 231 pharmacists from varied organisations and a wide range of experiences from across Australia participated in the survey, giving insight into what influences prioritisation in practice.

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**Acknowledgements:** Thank you to Angela Bandiani from the Medicines Information Centre at the University Hospital Southampton NHS Foundation Trust, for conducting the literature search.

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