**Additional file 1** Malmbrandt and Åhlstöm’s [28] instrument and the Lean in Healthcare Questionnaire (LiHcQ) divided into Liker’s [14] principles and domains.

Items kept in the **LiHcQ** are in boldface text. Items marked \* are newly developed for the present study.

|  |  |  |  |
| --- | --- | --- | --- |
| Items by Malmbrandt and Åhlstöm [28] | Items in the **LiHcQ** | Liker’s principles | Liker’s four domains (4P) |
| Employee commitmentEmployee understandingManagement commitmentManagement understandingTime for improvement work | **(1) Employee commitment****(2) Management commitment****(3) Time for improvement work** | 11111 | Philosophy-long-term thinking  |
| Value stream mappingWorkplace design for flowConnecting the processesBi-directional information flow | **(6) Value stream mapping** | 2222 | Processes-eliminate waste  |
| Pull system | **(10) Pull system** | 3 |
| Proactive planning | **(8) Proactive planning** | 4 |
| Built-in quality | **(9) Built-in quality** | 5 |
| Standardized tasksFormalization of work standards | **(7) Standardized tasks** | 66 |
| Visual signalsVisualization of informationVisualization of improvements | **(11) Visualization of improvements** | 777 |
| - | **(15) Use reliable technique that supports employees and processes\*** | 8 |
| Change agent | **(4) Change agent** | 9 | People and partners -respect, challenge and grow them |
| Identification of customer valueEmployee training Multifunctional teams | **(5) Identification of customer value** | 101010 |
| - | **(16) Show respect for partners and suppliers\*** | 11 |
| Structured problem solving | **(13) Structured problem-solving** | 12 | Problem-solving -continuous improvements  |
| - | **(14) Make decisions slowly and by consensus\*** | 13 |
| Employees measure and follow up workResources for improvement workEmployee participation in improvement workFocus of improvement workCustomer involvement Sustaining improvements | **(12) Employees measure and follow up work** | 141414141414 |