Author's Accepted Manuscript

Quality indicators for global benchmarking of localised prostate cancer management

Fanny Sampurno , Jia Zheng , Lydia Di Stefano , Jeremy L. Millar , Claire Foster , Ferran Fuedea , Celestia Higano , Hartwig Hulan , Stephen Mark , Caroline Moore , Alison Richardson , Frank Sullivan , Neil S. Wenger , Daniela Wittmann , Sue Evans

PII: S0022-5347(18)39377-7
DOI: 10.1016/j.juro.2018.02.071
Reference: JURO 15289

To appear in: *The Journal of Urology*
Accepted Date: 15 February 2018

Please cite this article as: Sampurno F, Zheng J, Di Stefano L, Millar JL, Foster C, Fuedea F, Higano C, Hulan H, Mark S, Moore C, Richardson A, Sullivan F, Wenger NS, Wittmann D, Evans S, Quality indicators for global benchmarking of localised prostate cancer management, *The Journal of Urology*® (2018), doi: 10.1016/j.juro.2018.02.071.

Title Page

Quality indicators for global benchmarking of localised prostate cancer management

Authors

Fanny Sampurno[a], Jia Zheng[a], Lydia Di Stefano[a], Jeremy L. Millar[b], Claire Foster PhD[c], Ferran Fuedea MD PhD[d], Celestia Higano MD FACP[e], Hartwig Hulan[f], Stephen Mark[g], Caroline Moore MD FRCS (Urol)[h], Alison Richardson BN (Hons) MSc PhD PGDip Ed RN[i], Frank Sullivan[j], Neil S. Wenger MD MPH[k], Daniela Wittmann PhD, MSW[l], Sue Evans PhD[a*]

Affiliations

[a] Department of Epidemiology and Preventive Medicine, Monash University. Melbourne, AUSTRALIA

[b] William Buckland Radiotherapy Centre, Alfred Health. Melbourne, AUSTRALIA

[c] Faculty of Health Sciences, University of Southampton, Southampton, SO17 1BJ, UNITED KINGDOM

[d] Chair of Radiation Oncology Department at Institut Català d'Oncologia, Professor in Radiation Oncology at Barcelona University, Head of Radiobiology & Cancer Group in Bellvitge Biochemical Research Institute (IDIBELL), SPAIN

[e] Department of Medicine, Division of Medical Oncology, University of Washington, Fred Hutchinson Cancer Research Center, Seattle, Washington, USA

[f] Martini-Klinik, Prostate Cancer Centre, University Hamburg, Germany

[g] Department of Urology, Christchurch Hospital, Clinical Lecturer University of Otago, Christchurch, NEW ZEALAND

[h] Reader in Urology, Division of Surgical and Interventional Science, University College London, London, UNITED KINGDOM

[i] Professor of Cancer Nursing & End of Life Care, Faculty of Health Sciences, University of Southampton & University Hospital Southampton, UNITED KINGDOM

[j] Prostate Cancer Institute, NUI Galway and Department of Radiation Oncology, Galway Clinic, Galway, IRELAND

[k] UCLA Division of General Internal Medicine, Los Angeles, CA, USA

[l] Department of Urology, University of Michigan, Ann Arbor, MI, USA

* Corresponding author

Keywords: Delphi Technique, global registry, prostatic neoplasms, quality indicator

Word count: 2,499 words

Abstract word count: 248 words

ABSTRACT

Purpose: To develop a core set of clinical indicators that enables international benchmarking of localised prostate cancer management using data available in the TrueNTH Global Registry.

Materials and Methods: An international expert panel completed an online survey and participated in a face-to-face meeting. Participants included urologists (n=3), radiation oncologists (n=3), psychologists (n=2), medical oncologist (n=1), nurse (n=1) and an epidemiologist (n=1) with prostate cancer expertise from seven countries. Current guidelines on prostate cancer treatment and potential quality indicators were identified from a literature review. These potential indicators were refined and developed through a modified Delphi process, during which each panellist independently and repeatedly rated each indicator based on its importance (satisfying the indicator demonstrates a provision of high-quality care) and feasibility (likelihood that data being used to construct the indicator could be collected at a population level). The main outcome measure was items with panel agreement (disagreement index<1), median importance ≥8.5 and median feasibility ≥9.

Results and Conclusions: Thirty-three indicators received endorsement from the expert panel. These 33 prostate cancer quality indicators assess care relating to diagnosis (n=7), primary treatment (n=7), salvage treatment (n=1) and health outcomes (n=18).

In summary, we have developed a set of quality indicators for measuring prostate cancer care from numerous international evidence-based clinical guidelines. These indicators will be pilot tested in the TrueNTH Global Registry. Reports comparing indicator performance will

subsequently be distributed to participating sites, with the purpose of improving the consistency and quality of prostate cancer management on a global basis.

BACKGROUND

Evidence-based practice, which promotes the judicious conscientious use of scientific evidence to inform clinical management, is a pillar of modern medicine. Innumerable best practice guidelines discussing the management of localised prostate cancer (PCa) have been published, aiding practitioners to understand the most appropriate management for the large number of men diagnosed with this disease each year.

Despite the accessibility of these guidelines, practice commonly varies from that recommended. For example, the rate of patients in the United States with high-risk PCa receiving first-line radiotherapy with concomitant androgen deprivation therapy (ADT), which is a National Comprehensive Cancer Network (NCCN) and European Association of Urology (EAU) recommendation, ranged from 58% to 75% and was declining[1]. Significant discrepancies in PCa care among different geographical regions have also been evidenced[2, 3].

Quality indicators (QIs) are explicitly defined, consensus-based, measurable items which enable comparison and act as a catalyst for improvement[4]. Indicators are currently being used to monitor PCa quality of care by the RAND Health Science Program in the United States[5], the National Prostate Cancer Register of Sweden[6], the prostate cancer centers certification program by the German Cancer Society[7] and the Prostate Cancer Outcomes Registry in Australia and New Zealand[8]. It remains a challenge to demonstrate that outcomes for men improve as a result of performance assessment against QIs, however promising examples exist. Dissemination of benchmarking provider performance to urologists in Victoria, Australia demonstrated improved adherence to three QIs over the 5-year study period[9]. In

Sweden, there was improvement in six out of nine QIs, including the number of men with very-low-risk disease undergoing AS, over a 3-year period[6].

The existence of numerous PCa registries and the development of international consensus minimum datasets for localised PCa by the International Consortium for Health Outcome Measures (ICHOM)[10] provides an opportunity to harness existing infrastructure and investment to establish core QIs. The TrueNTH Global Registry[11] has modelled clinical and patient-reported data on the ICHOM standard set for localised PCa[10]. This will provide a platform where data can be used to evidence performance against QIs, which will provided to participating organisations and allow comparison amongst peers. The paper describes an effort to identify a consensus set of QIs to benchmark PCa management among international groups contributing to the registry.

METHODS

We used a modified Delphi process, which combines scientific evidence with the professional expert opinion[12]. Approval was gained from the Monash University Human Research Ethics Committee (2016-5551-5405).

Panel composition and consent process

The panel was composed using purposive sampling of fifteen international leaders of Movember-funded PCa research activities. These invited individuals have expertise in PCa and were from countries involved in the TrueNTH Global Registry. Informed consent was obtained at the project's commencement.

Literature Review

A range of international guidelines for the diagnosis and management of localised PCa, restricted to those published in English, were reviewed (Supplementary Table 1). We also evaluated grey literature on indicator initiatives in available PCa programs (Supplementary Table 1) to identify potential indicators not stated in the guidelines. These guidelines and recommendations were collated. Study Investigators (FS, JZ, LDS, JM and SE) derived indicators from these recommendations and determined if they could be objectively measured and developed within the limitations of the registry dataset.

Online survey

In the first-round, panellists were asked to complete an online survey reviewing the refined list of proposed indicators. To maintain anonymity, each participant was given an identification number which was known only by two Investigators (FS and JZ). The indicators were presented chronologically, in line with the PCa management pathway (page 6, *Supplementary File 1*). Panellists received an accompanying document with each indicator's source, supporting strength of evidence and proposed construct (numerator and denominator) (page 22, *Supplementary File 1*). They were asked to rate each indicator's importance on a 9-point Likert scale (1= not important to 9= very important). Importance was defined as the extent to which satisfying the indicator demonstrated a provision of high-quality care and that, conversely, not meeting the indicator signalled poor-quality care. Panellists were asked to respond with 'unable to comment' if they could not give an informed professional opinion. They were encouraged to suggest modifications or propose new indicators.

To establish a consistent method of measuring indicators, panellists were asked to select a single risk stratification method which would be used to define low, intermediate and high-risk PCa.

Expert panel meeting

Using the first-round survey results, the median importance (MI) and disagreement index (DI) was calculated for all proposed indicators (*Table 1*). The MI ranged from 1-9. The DI is a continuous scale used to describe dispersion of ratings by panellists[12] (*Supplementary Table 2).* A DI of 0 represents complete agreement among panellists while a DI≥1 has been determined by RAND to indicate disagreement[12]. 'Unable to comment' responses were excluded from the calculations.

A traffic light system, with the colours green, amber and red, was used to differentiate between indicators with the greatest support and the greatest level of disagreement amongst panellists. Indicators with the greatest support, defined as a MI≥7 and DI<1, were categorised as *green*. All indicators with panel disagreement (DI≥1) were *amber*. Indicators with panel agreement (DI<1) and the lowest level of support (MI<7) were classified as *red*. This system is summarised in *Table 1*.

[Table 1 about here]

In keeping with the RAND Delphi process[12], an in-person meeting with an independent moderator (NW) was conducted to discuss survey results. All indicators from the first-round were addressed with a focus on those categorised as *amber* (MI>7, DI≥1). Following discussion of each indicator, panellists independently re-rated importance and also feasibility using the same 9-point Likert scale from the first-round (1= not important and 9= very important; 1= not feasible and 9= definitely feasible). Feasibility was defined as the likelihood that the data being used to construct the indicator could be collected at a

population level and be considered both reliable (able to be consistently produced) and valid (measure what it ought to measure). This was completed using their identification numbers either online or on paper, depending on individual preference.

Final review of indicators

Following the panel meeting, indicators with MI≥7, median feasibility (MF) ≥7 and DI<1 were presented to the panellists for review. With the final number of indicators restricted for practicality, they were asked to evaluate the cut-off point, in terms of MI and MF, for inclusion into the global registry.

RESULTS

11/15 (82%) of invited panellists accepted the invitation to participate in the study. *Table 2* provides a summary of their specialisation and country of practice.

[Table 2 about here]

The literature review revealed 352 potential indicators (76 diagnosis, 226 treatment and 50 outcomes) (*Figure 1*). Using Donabedian's[4] framework for classifying quality of care, this comprised of 18 structure, 294 process and 40 outcome measures. Of these, 229 were removed because they were not able to be constructed from the global registry dataset. The remaining 123 indicators were rated in the online survey. Results demonstrated that there was agreement (DI<1) among panellists that 70/123 indicators were very important (MI≥7) and that 4/123 (3%) were not important (MI<7). There was disagreement among panel members (DI≥1) for the remaining 49/123 (40%).

[Figure 1 about here]

The expert panel meeting was undertaken over 10 hours with nine panellists. Two panellists who voted were unable to participate. The panel reached consensus that the NCCN risk prediction model[13] would be used to stratify patients. Following discussion of the 123 indicators, 53 indicators were maintained without modification, 36 indicators maintained with modifications, 34 indicators removed and 6 indicators added. The number of indicators with disagreement reduced from 49 to 17. The panel retained all proposed structural indicators (100%), 35/78 proposed process measures (45%) and 18/43 proposed outcome indicators (42%).

For final review, 55 indicators with MI≥7, MF≥7 and DI<1 for both constructs were presented to the stakeholders (*Table 3*). Most indicators (28/55 (51%)) were treatment-related, 18/55 (33%) were outcome measures and 9/55 (16%) concerned diagnosis. The indicator, 'men with high-risk localised PCa do not receive AS' was removed as it was measured by 'men with high-risk localised PCa receive active treatment within 12 months'. Three indicators ('PSA level is taken post-surgery', 'PSA level is taken post-radiotherapy', 'PSA level is taken post-ablation therapy') were merged into 'PSA level is taken at 12 months after the start of active treatment'. Of the remaining 52 indicators (*Supplementary Table 3*), the consensus was to prioritise those that received MI≥8.5, MF≥9 and DI<1 for both constructs. This resulted in a total of 33 QIs for the implementation set (7 diagnosis, 8 treatment and 18 outcome); this list is presented in *Table 4*.

[Table 3 about here]

[Table 4 about here]

DISCUSSION

Of the 123 indicators presented to the panel, a set of 33 evidence- and consensus-based QIs were selected to initiate international PCa care benchmarking. This set of indicators addresses all major aspects of PCa management – diagnosis, intervention and patient-reported outcomes – and identifies areas of care which are potential targets for improving service.

Pre-treatment QIs which rated high in importance and feasibility included measurement of PSA level at diagnosis, documentation of clinical T-stage (cT) and use of imaging for staging. Previous cohort studies have demonstrated unnecessary and costly routine bone scans and computed tomography scans being performed for men with asymptomatic low-risk disease[14, 15]. Conversely, there remains suboptimal use in high-risk men[16] despite recommendations[13, 17]. Feedback of QIs regarding the documentation of cT stage[18] and bone scans for low-risk disease[19] have been shown to improve compliance with guidelines.

There was discussion among the Delphi panel on the use of multi-parametric magnetic resonance imaging (mpMRI) for pre-treatment staging. Whilst the panel regarded digital rectal examination (DRE) as the mainstay of practice, there was recognition of evidence demonstrating the superiority of mpMRI in detecting extra-capsular extension, seminal vesicle invasion[20] and informing treatment planning[20, 21]. However, in the absence of clear guidelines on the optimal staging protocol, both DRE and MRI were considered appropriate for assigning a disease stage.

A treatment indicator which received the greatest support was curative treatment being instigated in high-risk patients within 12 months. Although multimodality therapy is often recommended for high-risk PCa[13, 22, 23], the National Prostate Cancer Audit in UK reported that 39% of men with high-risk disease were undertreated with ADT monotherapy[24]. Likewise, the CaPSURE database demonstrated that 41% of high-risk patients received ADT monotherapy[25]. No age restrictions were placed on this indicator because elderly men with good quality-of-life may be suitable candidates for radical treatment[17]. Men who die within 12 months of diagnosis will be excluded as they are likely unsuitable candidates for active intervention. On the contrary, the challenge faced by men with low-risk disease is overtreatment and the morbidity of treatment-related complications. Active surveillance (AS) has been increasingly adopted as a standard approach for these men[6, 9]. There was unanimous consensus that the number of low-risk men on AS should be reported and that appropriate AS monitoring with a repeat prostate biopsy or MRI scan within 13 months of the diagnostic biopsy should also be measured.

Measurement of PSA level post-treatment was strongly advocated as it is the primary tool for measuring efficacy of treatment, detecting early signs of recurrence and need for salvage therapy[17, 26]. Other post-treatment risk assessment measures included 30-day mortality post-radical prostatectomy (RP), positive margins rates post-RP and biochemical recurrence post-RP and radiotherapy. Biochemical recurrence[27] was defined by our working group as PSA≥0.2 ng/mL post-RP and ≥2.0 ng/mL rise above nadir post-radiotherapy. The panel did not endorse biochemical recurrence post-ablation therapy as an indicator due to the current lack of an agreed definition[17, 28]. Instead, the rate of men who received radical or systemic treatment 18 months post-ablation therapy was nominated as a surrogate measure.

Routine collection of patient-reported outcomes (PROMs) has been shown to improve quality-of-life[29], survival and lessen future hospitalisations[30]. In addition to EPIC-26, ICHOM recommended including one question from EORTC QLQ-PR25#50 and two questions from the Use of Sexual Medication/Devices to improve the interpretability of the sexual function domain from the EPIC-26[10]. During the panel meeting, the measurement of pre- and post-treatment urinary, bowel, and sexual domains scores (QI 28-33, Table 4) were initially dropped in favour of indicators which assessed whether the survey instruments were administered at baseline and 12 months post-treatment (QI 22-27, Table 4). However, they were reinstated during the final review when it was recognised that merely collecting the EPIC-26 survey was inadequate and that it was important to understand the attributes of health services where patient reported good quality-of-life scores.

This study had a number of noteworthy limitations. A substantial proportion of recommendations were precluded because they could not be objectively measured or captured by the global registry dataset. This most heavily impacted structural indicators, such as the frequency of multidisciplinary meetings (MDM), representation of every discipline at MDM, availability of specialist services including psychological counselling and uro-oncology nurses. The use of the word 'offer'[17, 22] in patient-centred recommendations was also difficult to translate into measurable indicators. The inherent nature of the Delphi process means there is non-random selection of a small non-representative sample of panellists. The ratings are heavily influenced by personal experience and the availability of resources at different institutions. It is acknowledged that with a different composition of panellists, the final set of indicators could have been significantly altered. It is also recognised that there is a current lack of evidence demonstrating that these QIs will reduce PCa-specific survival.

The major strengths of this project included the heterogeneity of the panel, with 11 experts from seven different countries bringing important local perspectives to the discussion. The panel was facilitated by an independent experienced moderator to mitigate the probability of conversation being dominated by a few vocal participants. Indicators were constructed based on a pre-existing dataset, providing the opportunity for reports to be developed immediately. This project is novel in that it allows international benchmarking of PCa care and outcomes based on a common global dataset, which can act as a stimulus for improving PCa quality of care at each of the contributing sites.

Further effort to develop QIs which achieved MI and MF of 7 and 8 and investigate other potential indicators which cannot be currently measured by items in the global registry dataset will follow the initial rollout. Implemented indicators may demonstrate a 'ceiling effect' where it is difficult to further improve practice. Emerging technology may also change PCa management and evolve best practice guidelines. Accordingly, this set of indicators will be regularly re-evaluated to ensure their continued relevance and accuracy.

CONCLUSIONS

This study defined a set of 33 indicators conceived on the basis of existing international evidence-based clinical guidelines and endorsed by an international multidisciplinary expert panel. The indicators encompass the diagnosis, treatment and outcome aspects of PCa management. This set will be used to benchmark performance internationally in order to improve consistency and quality of care for men with PCa on a global basis.

CONFLICT OF INTEREST DISCLOSURES

Supported by the Movember Foundation.

REFERENCES

1. Dell'Oglio, P., Abou-Haidar, H., Leyh-Bannurah, S. R. et al.: Assessment of the Rate of Adherence to International Guidelines for Androgen Deprivation Therapy with External-beam Radiation Therapy: A Population-based Study. Eur Urol, **70:** 429, 2016
2. Morgia, G., Russo, G. I., Tubaro, A. et al.: Patterns of prescription and adherence to European Association of Urology guidelines on androgen deprivation therapy in prostate cancer: an Italian multicentre cross-sectional analysis from the Choosing Treatment for Prostate Cancer (CHOICE) study. BJU Int, **117:** 867, 2016
3. Schroeck, F. R., Kaufman, S. R., Jacobs, B. L. et al.: Regional variation in quality of prostate cancer care. J Urol, **191:** 957, 2014
4. Donabedian, A.: The quality of care. How can it be assessed? JAMA, **260:** 1743, 1988
5. Spencer, B. A., Steinberg, M., Malin, J. et al.: Quality-of-care indicators for early-stage prostate cancer. J Clin Oncol, **21:** 1928, 2003
6. Loeb, S., Folkvaljon, Y., Curnyn, C. et al.: Uptake of Active Surveillance for Very-Low-Risk Prostate Cancer in Sweden. JAMA Oncol, **3:** 1393, 2017
7. Kowalski, C., Ferencz, J., Albers, P. et al.: Quality assessment in prostate cancer centers certified by the German Cancer Society. World J Urol, **34:** 665, 2016
8. Nag, N., Millar, J., Davis, I. D. et al.: Development of Indicators to Assess Quality of Care for Prostate Cancer. Eur Urol Focus, 2016
9. Sampurno, F., Earnest, A., Kumari, P. B. et al.: Quality of care achievements of the Prostate Cancer Outcomes Registry-Victoria. Med J Aust, **204:** 319, 2016
10. Martin, N. E., Massey, L., Stowell, C. et al.: Defining a standard set of patient-centered outcomes for men with localized prostate cancer. Eur Urol, **67:** 460, 2015
11. Evans, S., Millar, J., Moore, C. et al.: Cohort profile: The TrueNTH Global Prostate Cancer Outcomes Registry - an international registry to monitor and improve localised prostate cancer health outcomes. BMJ Open. In press., 2017
12. Fitch K, Bernstein SJ, Aguilar MD, Burnand B, LaCalle JR, Lazaro P, van het Loo M, McDonnell J, Vader JP, Kahan JP: The RAND/UCLA Appropriateness Method User's Manual: RAND corporation. 2001, Available from https://www.rand.org/content/dam/rand/pubs/monograph_reports/2011/MR1269.pdf. Accessed August 2017.
13. National Comprehensive Cancer Network (NCCN) - Clinical Practice Guidelines in Oncology: Prostate Cancer (United States of America). Version 2.2017.
14. Choi, W. W., Williams, S. B., Gu, X. et al.: Overuse of imaging for staging low risk prostate cancer. J Urol, **185:** 1645, 2011
15. Falchook, A. D., Salloum, R. G., Hendrix, L. H. et al.: Use of Bone Scan During Initial Prostate Cancer Workup, Downstream Procedures, and Associated Medicare Costs. International Journal of Radiation Oncology Biology Physics, **89:** 243, 2014
16. Makarov, D. V., Desai, R. A., Yu, J. B. et al.: The population level prevalence and correlates of appropriate and inappropriate imaging to stage incident prostate cancer in the medicare population. J Urol, **187:** 97, 2012

17. European Association of Urology (EAU), Guidelines on Prostate Cancer, 2016, Available from: https://uroweb.org/wp-content/uploads/EAU-Guidelines-Prostate-Cancer-2016.pdf. Accessed December 2016.
18. Filson, C. P., Boer, B., Curry, J. et al.: Improvement in clinical TNM staging documentation within a prostate cancer quality improvement collaborative. Urology, **83:** 781, 2014
19. Makarov, D. V., Loeb, S., Ulmert, D. et al.: Prostate cancer imaging trends after a nationwide effort to discourage inappropriate prostate cancer imaging. J Natl Cancer Inst, **105:** 1306, 2013
20. Thompson, J., Lawrentschuk, N., Frydenberg, M. et al.: The role of magnetic resonance imaging in the diagnosis and management of prostate cancer. BJU Int, **112 Suppl 2:** 6, 2013
21. Terakedis, B. E., Heilbrun, M. E., Lowrance, W. T. et al.: The Effect of Prostate MRI on Cancer Staging and Radiation Therapy Treatment Recommendations. International Journal of Radiation Oncology Biology Physics, **84:** S363, 2012
22. National Institute for Health and Care Excellence (NICE), Prostate Cancer: Diagnosis and Management, 2016, Available from: https://www.nice.org.uk/guidance/cg175. Accessed December 2016.
23. National Cancer Control Programme (NCCP), Diagnosis, Staging and Treatment of Patients with Prostate Cancer, 2015, Available from: http://www.hse.ie/eng/services/list/5/cancer/profinfo/guidelines/prostate/prostateguideline.pdf. Accessed December 2016.
24. National Prostate Cancer Audit, UK
25. Hamilton, A. S., Albertsen, P. C., Johnson, T. K. et al.: Trends in the treatment of localized prostate cancer using supplemented cancer registry data. BJU Int, **107:** 576, 2011
26. American Urological Association (AUA), Radiotherapy after Prostatectomy, 2013, Available from: https://www.auanet.org/education/guidelines/radiation-after-prostatectomy.cfm. Accessed December 2016.
27. Cookson, M. S., Aus, G., Burnett, A. L. et al.: Variation in the definition of biochemical recurrence in patients treated for localized prostate cancer: the American Urological Association Prostate Guidelines for Localized Prostate Cancer Update Panel report and recommendations for a standard in the reporting of surgical outcomes. J Urol, **177:** 540, 2007
28. Babaian, R. J., Donnelly, B., Bahn, D. et al.: Best practice statement on cryosurgery for the treatment of localized prostate cancer. J Urol, **180:** 1993, 2008
29. Sanda, M. G., Dunn, R. L., Michalski, J. et al.: Quality of life and satisfaction with outcome among prostate-cancer survivors. N Engl J Med, **358:** 1250, 2008
30. Basch, E., Deal, A. M., Kris, M. G. et al.: Symptom Monitoring With Patient-Reported Outcomes During Routine Cancer Treatment: A Randomized Controlled Trial. J Clin Oncol, **34:** 557, 2016

Table 1: The criteria for indicator classification

		Median Importance								
		1	2	3	4	5	6	7	8	9
Disagreement Index	<1									
	≥1									

There is panel agreement that the quality indicator is of low importance

There is disagreement among the panel about the importance of the indicator

There is panel agreement that the quality indicator is of high importance

Table 2: Background of the specialists involved in the Delphi panel

	Urology	Radiation Oncology	Medical Oncology	Nursing	Public Health	Psychology	TOTAL
Australia	-	1	-	-	1	-	**2**
Germany	1	-	-	-	-	-	**1**
Ireland	-	1	-	-	-	-	**1**
New Zealand	1	-	-	-	-	-	**1**
Spain	-	1	-	-	-	-	**1**
UK	1	-	-	1	-	1	**3**
US	-	-	1	-	-	1	**2**
TOTAL	**3**	**3**	**1**	**1**	**1**	**2**	**11**

Table 3: Distribution of indicators in the summary document for final approval

		FEASIBILITY				
		7	**7.5**	**8**	**8.5**	**9**
IMPORTANCE	**7**	2 Diagnosis	2 Primary Tx - Other	1 Primary Tx - RT		
	8	2 Primary Tx - 1 RP - 1 Other		3 Primary Tx - 1 AS - 2 RP	1 Primary Tx - RT	5 Primary Tx - 2 RP - 3 RT 1 Salvage Tx
	9	1 Primary Tx - RT	1 Primary Tx - AS		2 Primary Tx - AS	7 Diagnosis 8 Primary Tx - 1 AS - 2 RP - 3 RT - 2 Other 1 Salvage Tx 18‡ Outcomes

‡6 indicators added (QI 28-33, Table 4)

Tx = Treatment; RP = Radical Prostatectomy; RT = External Beam Radiotherapy (EBRT)/ Brachytherapy; AS = Active Surveillance; WW = Watchful Waiting; QI = Quality Indicator

Table 4: Implementation set of indicators selected

Indicator		Numerator	Denominator	Exclusion Criteria	Reporting Time Point	Sources
DIAGNOSIS						
1	Initial investigations of a male with localised PCa include measurement of PSA level	Number of men with PSA level taken at diagnosis Note: PSA at diagnosis is PSA level taken within 180 days prior to or up to date of diagnosis.	Number of men with PCa	Men diagnosed via TURP or TURBT or biopsy taken using technique other than TRUS or transperineal or technique not stated.	Post diagnosis and pre-treatment∓	- Alberta Health Services 2015 [1] - NCCN 2017 [2] - VIC OCP 2015 [3]
2	T category/stage (DRE or MRI) is documented prior to treatment for localised PCa	Number of men with PCa who had T category/stage documented	Number of men with PCa		Post diagnosis and pre-treatment∓	- VIC OCP 2015 [3]
3	In men with high risk localised PCa, nodal staging using CT, MRI or PET is performed	Number of men with high risk PCa who underwent CT scan, MRI scan or PET scan	Number of men with high risk PCa		Post diagnosis and pre-treatment∓	- EAU 2016 [4] - ESMO 2015 [5] - NCCP 2015 [6] - NZ PCT 2013 [7]
4	In men with high risk localised PCa, perform metastatic screening using a CT/MRI and a bone scan	Number of men with high risk PCa who underwent a CT/MRI and a bone scan	Number of men with high risk PCa		Post diagnosis and pre-treatment∓	- Alberta Health Services 2015 [1] - EAU 2016 [4]
5	In men with intermediate risk localised PCa, a bone scan is not conducted	Number of men with intermediate risk PCa who did not have a bone scan	Number of men with intermediate risk PCa	Men with 4+3 disease	Post diagnosis and pre-treatment∓	- NCCS 2013 [8]
6	In men with low risk localised PCa, a bone scan is not conducted	Number of men with low risk PCa who did not have a bone scan	Number of men with low risk PCa		Post diagnosis and pre-treatment∓	- EAU 2016 [4] - NICE 2014 [9]

7	In men with low risk localised PCa, a CT is not conducted	Number of men with low risk PCa who did not have a CT scan	Number of men with low risk PCa		Post diagnosis and pre-treatment[∓]	- Alberta Health Services 2015 [1] - EAU 2016 [4] - NICE 2014 [9]
PRIMARY TREATMENT						
8	For pN0 men undergoing RP, adjuvant ADT is not given	Number of men who had RP with pN0 and did not receive adjuvant ADT Note: Adjuvant ADT is defined as ADT within 6 months of RP	Number of men who had RP with pN0		Post primary RP[∓]	- EAU 2016 [4]
9	Men with localised PCa who are undergoing radical EBRT receive a minimum dose of 74Gy in 1.8 – 2.0 Gy standard fractionation or the equivalent hypo-fractionated dose, 60Gy in 3.0 Gy fractions	Number of men undergoing EBRT with curative intent who receive dose ≥74Gy in 1.8 – 2.0 Gy fractional doses OR ≥60 Gy in 3.0 Gy fractions	Number of men undergoing EBRT		Post primary EBRT[∓]	- EAU 2016 [4] - NICE 2016 [9]
10	Men with low risk localised PCa receive AS	Number of men with low risk prostate cancer and on AS	Number of men with low risk PCa		Post diagnosis[∓]	- BAUS 2013 [10] - Cancer Care Ontario 2014 [11] - NZ PCT 2013 [7]
11	For men on AS, MRI or repeat biopsy is performed within 13 months of the diagnostic biopsy	Number of men on AS who had MRI or repeat biopsy within 13 months of the diagnostic biopsy Note: MRI can occur prior to diagnostic biopsy	Number of men on AS	Men who died within 13 months of the diagnostic biopsy	13 months post diagnosis	- NCCP 2015 [6] - NICE 2016 [9]

12	Men with high risk localised PCa receive active treatment within 12 months	Number of men with high risk PCa who have had RP or EBRT or HDR or LDR or whole-gland or focal-gland ablation therapy within 12 months of diagnosis	Number of men with high risk PCa	Men who died within 12 months of active treatment	12 months post diagnosis	- KCE 2014 [12] - NICE 2014 [9] - NZ PCT 2013 [7]
13	Men with high risk localised PCa do not receive LDR brachytherapy alone	Number of men with high risk PCa who receive LDR and primary EBRT	Number of men with high risk PCa who received LDR		Post primary LDR[∓]	- NICE 2016 [9]
14	PSA level is taken within 12 months of active treatment	Number of men who had PSA taken within 12 months of active treatment	Number of men on active treatment Note: active treatment includes RP, EBRT, brachytherapy, whole-gland or focal gland ablation therapy	Men who died within 12 months of diagnosis	12 months post active treatment	- NICE 2016 [9]
SALVAGE TREATMENT						
15	Men who have salvage RT post RP receive a salvage RT dose ≥66 Gy at 1.8 - 2.0 standard fractionation or the equivalent hypo-fractionated dose, ≥48 Gy in 3.0 Gy fractions	Number of men who had salvage EBRT initiated post-RP with a total receive dose ≥66Gy in 1.8 – 2.0 fractional doses or ≥48 Gy in 3.0 Gy fraction	Number of men who received salvage EBRT post RP		Post salvage RT[∓]	- NCCN 2017 [2]

CLINICAL OUTCOMES						
16	Death within 30 days of RP	Number of men who died within 30 days of the RP	Number of men who had RP		30 days post RP	- PCOR-ANZ‡ [13]
17	Men with low risk PCa who had a positive margin post-RP	Number of men with low risk PCa and had a positive margin post-RP	Number of men with low risk PCa and had a RP		Post primary RP∓	- PCOR-ANZ‡ [13]
18	Men with pT2 disease who had a positive margin post-RP	Number of men with pT2 disease and had a positive margin post-RP	Number of men with pT2 disease and had a RP		Post primary RP∓	- German Cancer Society‡ [14] - IPCOR‡ [15] - NPCR‡ [16] - PCOR-ANZ‡ [13]
19	Men with pT3 disease who had a positive margin post-RP	Number of men with pT3 disease and had a positive margin post-RP	Number of men with pT3 disease and had a RP		Post primary RP∓	- IPCOR‡ [15] - PCOR-ANZ‡ [13]
20	Biochemical recurrence at 1 year post RP	Number of men who had RP and a PSA level 12 month post RP ≥0.2 ng/mL	Number of men who had RP		1 year post primary RP	- AUA 2013 [17] - EAU 2016 [4]
21	Radical or systemic treatment at 18 months post focal-gland or whole-gland ablation therapy	Number of men who had focal-gland or whole-gland ablation therapy and radical treatment or systemic treatment initiated within 18 months post focal-gland or whole-gland ablation therapy Note: Radical treatment includes RP, EBRT or brachytherapy. Systemic	Number of men who had focal-gland or whole-gland ablation therapy	Men who died within 18 months of focal-gland or whole-gland ablation therapy	18 months post primary ablation therapy	- EAU 2016[4] - Babaian et al. ‡[18] - Donnelly et al. ‡ [19]

		treatment refers to ADT.				
PATIENT-REPORTED OUTCOMES						
22	EPIC-26 is completed at baseline	Number of men completed EPIC-26 within 90 days before or after diagnosis	Number of men with PCa		Post diagnosis and pre-treatment∓	- Wei et al. ∓[20] - NPCR∓ [16] - PCOR-ANZ∓ [13]
23	EORTC QLQ-PR25 is completed at baseline	Number of men completed EORTC QLQ-PR25 within 90 days before or after diagnosis	Number of men with PCa		Post diagnosis and pre-treatment ∓	- Van Andel et al. [21]
24	Utilisation of Sexual Medication/Devices is completed at baseline	Number of men completed Utilisation of Sexual Medication/Devices questionnaire within 90 days before or after diagnosis	Number of men with PCa		Post diagnosis and pre-treatment∓	- Miller et al. ∓ [22]
25	EPIC-26 is completed 12 months post diagnosis for men on AS and 12 months post active treatment for men receiving active treatment	Number of men completed EPIC 26 within 9-15 months of diagnosis (AS)/ or 9-15 months of active treatment	Number of men with PCa	Men who died within 15 months of diagnosis (AS)/ within 15 months of active treatment	15 months post diagnosis (AS) / 15 months post active treatment	- Wei et al. ∓ [20] - IPCOR∓ [15] - PCOR-ANZ∓ [13]
26	EORTC QLQ-PR25 is completed 12 months post diagnosis for men on AS and 12 months post active treatment for men receiving active treatment	Number of men completed EORTC QLQ-PR25 within 9-15 months of diagnosis (AS)/ or 9-15 months of active treatment	Number of men with PCa	Men who died within 15 months of diagnosis (AS)/ within 15 months of active treatment	15 months post diagnosis (AS) / 15 months post active treatment	- Van Andel et al. ∓ [21]
27	Utilisation of Sexual Medication/Devices is completed	Number of men completed Utilisation of	Number of men with PCa	Men who died within 15 months of	15 months post diagnosis (AS)	- Miller et al. ∓ [22]

	12 months post diagnosis for men on AS and 12 months post active treatment for men receiving active treatment	Sexual Medication/Devices within 9-15 months of diagnosis (AS)/ or 9-15 months of active treatment		diagnosis (AS)/ within 15 months of active treatment	/ 15 months post active treatment	
28	Sexual bother at 12 month adjusted by treatment group and PROMs at baseline	Change in the mean score of sexual bother between the baseline and 12 months by type of treatment	Number of men with PCa	Men who did not complete EPIC-26 at baseline or at 12 months	15 months post diagnosis (AS) / 15 months post active treatment	- PCOR-ANZ‡ [13] - RAND‡ [23]
29	Urinary bother at 12 month adjusted by treatment group and PROMs at baseline	Change in the mean score of urinary bother between baseline and 12 months by type of treatment	Number of men with PCa	Men who did not complete EPIC-26 at either baseline or at 12 months	15 months post diagnosis (AS) / 15 months post active treatment	- PCOR-ANZ‡ [13] - RAND‡ [23]
30	Bowel bother at 12 month adjusted by treatment group and PROMs at baseline	Change in the mean score of bowel bother between baseline and 12 months by type of treatment	Number of men with PCa	Men who did not complete EPIC-26 at either baseline or at 12 months	15 months post diagnosis (AS) / 15 months post active treatment	- PCOR-ANZ‡ [13] - RAND‡ [23]
31	Sexual function at 12 month adjusted by treatment group and PROMs at baseline	Change in the mean score of sexual domain score between baseline and 12 months by type of treatment	Number of men with PCa	Men who did not complete EPIC-26 at either baseline or at 12 months	15 months post diagnosis (AS) / 15 months post active treatment	- NPCR‡ [16] - PCOR-ANZ‡ [13] - RAND‡ [23]
32	Urinary function at 12 month adjusted by treatment group and PROMs at baseline	Change in the mean score of urinary incontinence domain score between baseline and 12 months by type of treatment	Number of men with PCa	Men who did not complete EPIC-26 at either baseline or at 12 months	15 months post diagnosis (AS) / 15 months post active treatment	- NPCR‡ [16] - PCOR-ANZ‡ [13] - RAND‡ [23]

		Change in the mean score of urinary obstructive domain score between baseline and 12 months by type of treatment				
33	Bowel function at 12 month adjusted by treatment group and PROMs at baseline	Change in the mean of bowel domain score between baseline and 12 months by type of treatment	Number of men with PCa	Men who did not complete EPIC-26 at either baseline or at 12 months	15 months post diagnosis (AS) / 15 months post active treatment	- NPCR‡ [16] - PCOR-ANZ‡ [13] - RAND‡ [23]

‡ Quality Indicator (QI) report will be disseminated to participating sites every six months.

**All risk is based on the NCCN risk classification and is assessed based on the highest primary Gleason score (if more than one biopsies were undertaken), the latest clinical T and the latest PSA prior to systemic or radical treatment. In the absence of a clinical T, men can be assumed to be low risk if Gleason score ≤6 (Grade group = 1) and PSA<10.

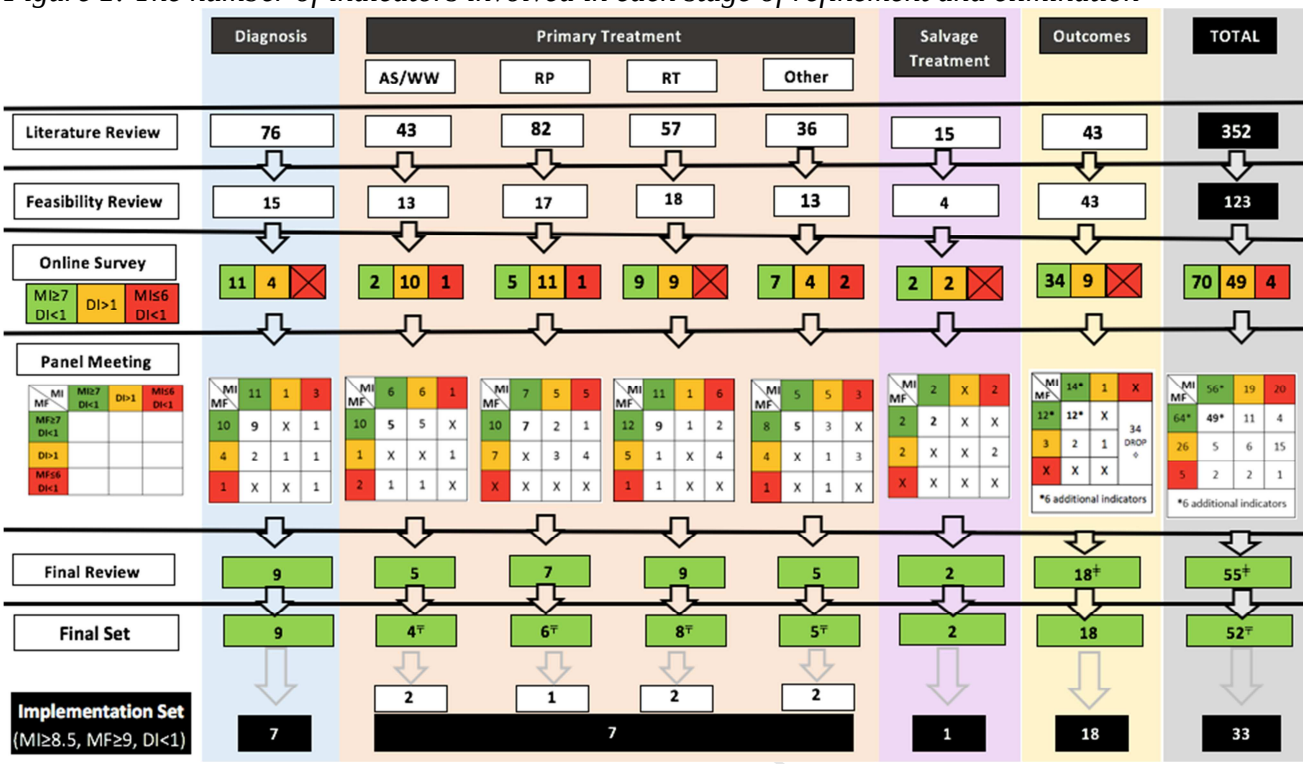
‡Due to the lack of clinical guidelines, a range of grey literatures on indicator initiatives by prostate cancer programs were used as the basis of quality indicators

REFERENCES

1. Alberta Health Services, Clinical Practice Guidelines for Prostate Cancer, 2015, Available from: http://www.albertahealthservices.ca/assets/info/hp/cancer/if-hp-cancer-guide-gu004-prostate.pdf Accessed December 2016.
2. National Comprehensive Cancer Network (NCCN) - Clinical Practice Guidelines in Oncology: Prostate Cancer (United States of America). Version 2.2017.
3. Cancer Council Victoria, Optimal Care Pathway for Men with Prostate Cancer (VIC OCP), 2015, Australia, Available from: http://www.cancervic.org.au/downloads/health-professionals/optimal-care-pathways/Optimal_care_pathway_for_men_with_prostate_cancer.pdf. Accessed December 2016.
4. European Association of Urology (EAU), Guidelines on Prostate Cancer, 2016, Available from: https://uroweb.org/wp-content/uploads/EAU-Guidelines-Prostate-Cancer-2016.pdf. Accessed December 2016.
5. European Society for Medical Oncology (ESMO), Cancer of the Prostate: ESMO Clinical Practice Guidelines for Diagnosis, Treatment and Follow-Up, 2015, Available from: http://www.esmo.org/Guidelines/Genitourinary-Cancers/Cancer-of-the-Prostate Accessed December 2016.
6. National Cancer Control Programme (NCCP), Diagnosis, Staging and Treatment of Patients with Prostate Cancer, 2015, Available from: http://www.hse.ie/eng/services/list/5/cancer/profinfo/guidelines/prostate/prostateguideline.pdf. Accessed December 2016.
7. Prostate Cancer Taskforce, Diagnosis and Management of Prostate Cancer in New Zealand Men, 2012, Available from: http://www.prostate.org.nz/documents/diagnosis-management-prostate-cancer-nz-men_(3).pdf. Accessed December 2016.
8. National Cancer Centre Singapore (NCCS), Guidelines on Management of Prostate Cancer, 2013, Available from: http://www.annals.edu.sg/pdf/42VolNo4Apr2013/V42N4p190.pdf Accessed December 2016.
9. National Institute for Health and Care Excellence (NICE), Prostate Cancer: Diagnosis and Management, 2016, Available from: https://www.nice.org.uk/guidance/cg175. Accessed December 2016.
10. British Association of Urological Surgeons (BAUS), Multi-disciplinary Team (MDT) Guidance for Managing Prostate Cancer, 2013, Available from: http://www.baus.org.uk/_userfiles/pages/files/Publications/MDT Prostate Cancer Guidance.pdf. Accessed December 2016.
11. Cancer Care Ontario, Active Surveillance for the Management of Localized Prostate Cancer, 2014, Available from: https://www.cancercare.on.ca/common/pages/UserFile.aspx?fileId=325696, Accessed December 2016.
12. Belgian Health Care Knowledge Centre (KCE), National Practice Guideline on the Treatment of Localized Prostate Cancer, 2014, Available from: https://kce.fgov.be/sites/default/files/page_documents/KCE_226Cs_prostate%20cancer_part2_synthesis.pdf. Accessed December 2016.
13. Nag, N., Millar, J., Davis, I. D. et al.: Development of Indicators to Assess Quality of Care for Prostate Cancer. Eur Urol Focus, 2016
14. Kowalski, C., Ferencz, J., Albers, P. et al.: Quality assessment in prostate cancer centers certified by the German Cancer Society. World J Urol, **34:** 665, 2016
15. Irish Prostate Cancer Outcomes Research
16. Stattin, P., Sandin, F., Sandback, T. et al.: Dashboard report on performance on select quality indicators to cancer care providers. Scand J Urol, **50:** 21, 2016

17. American Urological Association (AUA), Radiotherapy after Prostatectomy, 2013, Available from: https://www.auanet.org/education/guidelines/radiation-after-prostatectomy.cfm. Accessed December 2016.
18. Babaian, R. J., Donnelly, B., Bahn, D. et al.: Best practice statement on cryosurgery for the treatment of localized prostate cancer. J Urol, **180:** 1993, 2008
19. Donnelly, B. J., Saliken, J. C., Ernst, D. S. et al.: Prospective trial of cryosurgical ablation of the prostate: five-year results. Urology, **60:** 645, 2002
20. Wei, J. T., Dunn, R. L., Litwin, M. S. et al.: Development and validation of the expanded prostate cancer index composite (EPIC) for comprehensive assessment of health-related quality of life in men with prostate cancer. Urology, **56:** 899, 2000
21. van Andel, G., Bottomley, A., Fossa, S. D. et al.: An international field study of the EORTC QLQ-PR25: a questionnaire for assessing the health-related quality of life of patients with prostate cancer. Eur J Cancer, **44:** 2418, 2008
22. Miller, D. C., Wei, J. T., Dunn, R. L. et al.: Use of medications or devices for erectile dysfunction among long-term prostate cancer treatment survivors: Potential influence of sexual motivation and/or indifference. Urology, **68:** 166, 2006
23. Spencer, B. A., Steinberg, M., Malin, J. et al.: Quality-of-care indicators for early-stage prostate cancer. J Clin Oncol, **21:** 1928, 2003

Figure 1: The number of indicators involved in each stage of refinement and elimination



MI: Median importance
MF: Median feasibility
DI: Disagreement index
AS/WW: Active surveillance/ watchful waiting
RP: Radical prostatectomy
RT: Radiotherapy

*6 indicators added (QI 22-27, Table 4) during the panel meeting.

♢ 34 indicators were removed during the panel meeting.

Ŧ 3 indicators related to PSA level were merged into *'PSA level is taken at 12 month after the start of active treatment'*.

ǂ6 indicators added (QI 28-33, Table 4)

ABBREVIATIONS:

ADT	Androgen deprivation therapy
AS	Active surveillance
cT	Clinical T-stage
DI	Disagreement index
DRE	Digital rectal examination
EAU	European Association of Urology
ICHOM	International Consortium for Health Outcome Measures
MF	Median feasibility
MI	Median importance
mpMRI	Multi-parametric magnetic resonance imaging
NCCN	National Comprehensive Cancer Network
NPCR	National Prostate Cancer Registry of Sweden
PSA	Prostate specific antigen
PCa	Prostate cancer
PCOR-ANZ	Prostate Cancer Outcomes Registry in Australia and New Zealand
PROMs	patient-reported outcomes
QI	Quality indicator
RP	Radical prostatectomy

Supplementary Table 1: International guidelines and grey literature used

Guidelines or prostate cancer programs where indicators were derived	**Number of guidelines**	**References**
Australasian	5	(1-5)
European	8	(6-13)
American and Canadian	5	(14-18)
Grey literature on indicator initiatives in available prostate cancer programs	6	(19-24)

References

1. Andrology Australia, Clinical Practice Guidelines for the Management of Locally Advanced and Metastatic Cancer, 2010, Available from: https://www.andrologyaustralia.org/wp-content/uploads/FINAL_Advanced_Prostate_Cancer_Guidelines.pdf. Accessed December 2016.
2. Cancer Council Australia, Prostate Cancer Clinical Guidelines, 2016, Available from: http://wiki.cancer.org.au/australia/Guidelines:Prostate_cancer/Management/Locally_advanced_and_metastatic. Accessed December 2016.
3. National Cancer Centre Singapore (NCCS), Guidelines on Management of Prostate Cancer, 2013, Available from: http://www.annals.edu.sg/pdf/42VolNo4Apr2013/V42N4p190.pdf Accessed December 2016.
4. Prostate Cancer Taskforce, Diagnosis and Management of Prostate Cancer in New Zealand Men, 2012, Available from: http://www.prostate.org.nz/documents/diagnosis-management-prostate-cancer-nz-men_(3).pdf. Accessed December 2016.
5. Cancer Council Victoria, Optimal Care Pathway for Men with Prostate Cancer (VIC OCP), 2015, Australia, Available from: http://www.cancervic.org.au/downloads/health-professionals/optimal-care-pathways/Optimal_care_pathway_for_men_with_prostate_cancer.pdf. Accessed December 2016.
6. Alberta Health Services, Clinical Practice Guidelines for Prostate Cancer, 2015, Available from: http://www.albertahealthservices.ca/assets/info/hp/cancer/if-hp-cancer-guide-gu004-prostate.pdf Accessed December 2016.
7. British Association of Urological Surgeons (BAUS), Multi-disciplinary Team (MDT) Guidance for Managing Prostate Cancer, 2013, Available from: http://www.baus.org.uk/_userfiles/pages/files/Publications/MDT Prostate Cancer Guidance.pdf. Accessed December 2016.
8. European Association of Urology (EAU), Guidelines on Male Sexual Dysfunction, 2015, Available from: ttp://uroweb.org/wp-content/uploads/14-Male-Sexual-Dysfunction_LR1.pdf Accessed December 2016.
9. European Association of Urology (EAU), Guidelines on Prostate Cancer, 2016, Available from: https://uroweb.org/wp-content/uploads/EAU-Guidelines-Prostate-Cancer-2016.pdf. Accessed December 2016.
10. European Society for Medical Oncology (ESMO), Cancer of the Prostate: ESMO Clinical Practice Guidelines for Diagnosis, Treatment and Follow-Up, 2015, Available from: http://www.esmo.org/Guidelines/Genitourinary-Cancers/Cancer-of-the-Prostate Accessed December 2016.
11. Belgian Health Care Knowledge Centre (KCE), National Practice Guideline on the Treatment of Localized Prostate Cancer, 2014, Available from: https://kce.fgov.be/sites/default/files/page_documents/KCE_226Cs_prostate%20cancer_part2_synthesis.pdf. Accessed December 2016.
12. National Cancer Control Programme (NCCP), Diagnosis, Staging and Treatment of Patients with Prostate Cancer, 2015, Available from:

http://www.hse.ie/eng/services/list/5/cancer/profinfo/guidelines/prostate/prostateguideline.pdf. Accessed December 2016.
13. National Institute for Health and Care Excellence (NICE), Prostate Cancer: Diagnosis and Management, 2016, Available from: https://www.nice.org.uk/guidance/cg175. Accessed December 2016.
14. American Urological Association (AUA), Radiotherapy after Prostatectomy, 2013, Available from: https://www.auanet.org/education/guidelines/radiation-after-prostatectomy.cfm. Accessed December 2016.
15. American Urological Association (AUA), Best Practice Policy Statement on Cyrosurgery for the Treatment of Localised Prostate Cancer, 2008, https://www.auanet.org/education/guidelines/cryosurgery.cfm, Accessed December 2016.
16. Cancer Care Ontario, Active Surveillance for the Management of Localized Prostate Cancer, 2014, Available from: https://www.cancercare.on.ca/common/pages/UserFile.aspx?fileId=325696, Accessed December 2016.
17. National Cancer Institute, Prostate Cancer Treatment, 2016, Avaliable from: https://www.cancer.gov/types/prostate/hp/prostate-treatment-pdq Accessed December 2016.
18. National Comprehensive Cancer Network (NCCN) - Clinical Practice Guidelines in Oncology: Prostate Cancer (United States of America). Version 2.2017.
19. Irish Prostate Cancer Outcomes Research. Available from: http://www.ipcor.ie/Clinicians-and-Institutions/Measuring-Quality-of-Care. Accessed August 2017.
20. Montie, J. E., Linsell, S. M., & Miller, D. C. (2014). Quality of care in urology and the Michigan Urological Surgery Improvement Collaborative. Urology Practice, 1(2), 74-78. DOI: 10.1016/j.urpr.2014.04.003.
21. Kowalski C, Ferencz J, Albers P, Fichtner J, Wiegel T, Feick G, et al. Quality assessment in prostate cancer centers certified by the German Cancer Society. World J Urol. 2016;34(5):665-72.
22. Nag N, Millar J, Davis ID, Costello S, Duthie JB, Mark S, et al. Development of Indicators to Assess Quality of Care for Prostate Cancer. Eur Urol Focus. 2016.
23. Spencer BA, Steinberg M, Malin J, Adams J, Litwin MS. Quality-of-care indicators for early-stage prostate cancer. J Clin Oncol. 2003;21(10):1928-36.
24. Stattin P, Sandin F, Sandback T, Damber JE, Franck Lissbrant I, Robinson D, et al. Dashboard report on performance on select quality indicators to cancer care providers. Scand J Urol. 2016;50(1):21-8.

Supplementary Table 2: How the statistics are calculated

HOW THE STATISTICS ARE CALCULATED

Supplementary Table 2a: Example rating of how each panellist rated the proposed indicator

Panellist ID	#1	#2	#3	#4	#5	#6	#7	#8	#9	#10	#11
Rating given (from 1-9)	9	9	X	9	9	9	9	7	9	7	9

Supplementary Table 2b: How the statistics, which have been used to classify indicators, are calculated (1)

Measure	Definition	How to calculate	Results
Median	An observation at the 50th percentile	50th percentile	9
Lower IPR	An observation at the 10th percentile	10th percentile	7
Upper IPR	An observation at the 90th percentile	90th percentile	9
IPR	The interpercentile range. It is a measure of dispersion of a distribution.	Upper IPR – Lower IPR	2
IPRCP	The central point of IPR	(Lower IPR + Upper IPR)/2	8
Asymmetry index	The distance between the central point of the IPR and the central point of the 1-9 scale, i.e. 5	Absolute value (5-IPRCP)	3
IPRAS	The interpercentile range adjusted for symmetry. It is a measure of the degree of asymmetry across the 9-point scale. Using the numbers supplied by the RAND document[1] : **IPRAS = 2.35 + (1.5 x Asymmetry Index)**	= IPRr + (CFA x Asymmetry Index) IPRr is the interpercentile range required for disagreement when there is perfect symmetry. CFA is the correction factor for asymmetry, which is a constant set at 1.5	**6.85**
Disagreement Index (DI)	It is a measure which shows if there was wide or limited dispersion of panellist ratings	IPR/IPRAS	0.29 **0.29 < 1 Therefore, there is agreement**
	 If the DI is ≥ 1, then it indicates 'extreme variation' in ratings. The lower the DI, the lower the level of disagreement (i.e. the higher the level of agreement/ better consensus).		
Note: 'Unable to comment' responses were excluded when calculating the statistics.			

1. Fitch K, Bernstein SJ, Aguilar MD, Burnand B, LaCalle JR, Lazaro P, van het Loo M, McDonnell J, Vader JP, Kahan JP: The RAND/UCLA Appropriateness Method User's Manual: RAND corporation. 2001, Available from https://www.rand.org/content/dam/rand/pubs/monograph_reports/2011/MR1269.pdf Accessed August 2017.

Supplementary Table 3: Final set of indicators (median importance of 7-9 and a median feasibility score of 7-9 and DI<1 for both constructs)

DIAGNOSIS		**DIMENSION OF QUALITY OF CARE (1)**
1	Initial investigations of a male with localised PCa include measurement of PSA level	Process
2	T category/stage (DRE or MRI) is documented prior to treatment for localised PCa	Process
3	In men with high risk localised PCa, nodal staging using CT, MRI or PET/CT is performed	Process
4	In men with high risk localised PCa, perform metastatic screening using a CT/MRI and a bone scan	Process
5	In men with intermediate risk localised PCa, a bone scan is not conducted	Process
6	In men with high risk localised PCa, a bone scan is conducted	Process
7	In men with cT3/cT4, a bone scan is performed	Process
8	In men with low risk PCa, a bone scan is not conducted	Process
9	In men with low risk localised PCa, a CT is not conducted	Process
PRIMARY TREATMENT		
10	Men with low risk localised PCa receive AS	Process
11	Men with low risk PCa with ≤2 positive cores and minimal biopsy core involvement (<50% cancer per biopsy) receive AS	Process
12	For men on AS, MRI or repeat biopsy is performed within 13 months of the diagnostic biopsy	Process
13	In men on AS with a primary Gleason grade of 4 or 5 on repeat biopsy, active treatment is initiated	Process
14	Men with low risk localised Pca who received RP, nerve-sparing is performed	Process
15	Men with intermediate risk localised PCa who received RP, nerve-sparing is performed	Process
16	For pN0 men undergoing RP, adjuvant ADT is not given	Process
17	For pN0 men undergoing RP, even those with positive margin rate, adjuvant ADT is not given	Process
18	Men with pT3 disease, positive margin(s) and detectable PSA post-RP receive EBRT within 6 months of RP	Process
19	The recommended prescribed doses for adjuvant post-prostatectomy RT are 64–72 Gy in standard fractionation or the equivalent of hypofractionation	Process
20	Men with localised PCa who are undergoing radical EBRT receive a minimum dose of 74Gy in 1.8 – 2.0 Gy standard fractionation or the equivalent hypo-fractionated dose, 60Gy in 3.0 Gy fractions	Process
21	RT should treat the prostate planning target volume with 74-78Gy	Process
22	Men with low risk localised Pca undergoing EBRT do not receive	Process

	adjuvant ADT	
23	Men with low risk localised PCa who receive LDR brachytherapy receive it as monotherapy	Process
24	Men with high risk localised PCa and undergoing EBRT receive 2-3 years of adjuvant ADT	Process
25	Men with high risk localised Pca who received HDR brachytherapy and also receive EBRT within 30 days	Process
26	Men with high risk localised PCa do not receive LDR brachytherapy alone	Process
27	Men with high risk localised PCa treated with a combination of EBRT (40–50 Gy) and LDR brachytherapy receive > 1 year ADT	Process
28	Men treated with focal therapy have had assessment with MRI prior to focal therapy	Process
29	Number of men treated at the institution per year having RP	Structure
30	Number of men treated at the institution per year having EBRT or brachytherapy	Structure
31	Men with high risk localised PCa receive active treatment within 12 months	Process
32	PSA level is taken within 12 months of active treatment	Process
SALVAGE TREATMENT		
33	In men with undetectable PSA post RP who have biochemical recurrence, salvage RT is not started after PSA≥ 2.0ng/mL	Process
34	Men who have salvage RT post RP receive a salvage RT dose ≥66 Gy at 1.8 - 2.0 standard fractionation or the equivalent hypo-fractionated dose, ≥48 Gy in 3.0 Gy fractions	Process
OUTCOMES		
35	EPIC-26 is completed at baseline	Outcome
36	EORTC QLQ-PR25 is completed at baseline	Outcome
37	Utilisation of Sexual Medication/Devices is completed at baseline	Outcome
38	EPIC-26 is completed 12 months post diagnosis for men on AS and 12 months post active treatment for men receiving active treatment	Outcome
39	EORTC QLQ-PR25 is completed 12 months post diagnosis for men on AS and 12 months post active treatment for men receiving active treatment	Outcome
40	Utilisation of Sexual Medication/Devices is completed 12 months post diagnosis for men on AS and 12 months post active treatment for men receiving active treatment	Outcome
41	Sexual bother at 12 month adjusted by treatment group and PROMs at baseline	Outcome
42	Urinary bother at 12 month adjusted by treatment group and PROMs at baseline	Outcome
43	Bowel bother at 12 month adjusted by treatment group and PROMs at baseline	Outcome
44	Sexual function at 12 month adjusted by treatment group and PROMs at baseline	Outcome
45	Urinary function at 12 month adjusted by treatment group and PROMs at baseline	Outcome
46	Bowel function at 12 month adjusted by treatment group and PROMs at baseline	Outcome

47	Death within 30 days of RP	Outcome
48	Men with low risk PCa who had a positive margin post-RP	Outcome
49	Men with pT2 disease who had a positive margin post-RP	Outcome
50	Men with pT3 disease who had a positive margin post-RP	Outcome
51	Biochemical recurrence at 1 year post RP	Outcome
52	Radical or systemic treatment at 18 months post focal-gland or whole-gland ablation therapy	Outcome

REFERENCES

1. Donabedian A. The quality of care. How can it be assessed? JAMA. 1988;260(12):1743-8.