Primary Care Physicians’ Action Plans for Responding to Results of Screening Tests Based on the Concept of Quaternary Prevention

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Since noncommunicable diseases (NCDs) are generally controllable rather than curable, more emphasis is placed on prevention than on treatment. For the early detection of diseases, primary care physicians (PCPs), as well as general practitioners and family physicians, should interpret screening results accurately and provide screenees with appropriate information about prevention and treatment, including potential harms. The concept of quaternary prevention (QP), which was introduced by Jamoulle and Roland in 1995, has been applied to screening results. This article summarizes situations that PCPs encounter during screening tests according to the concept of QP, and suggests measures to face such situations. It is suggested that screening tests be customized to fit individual characteristics instead of being performed based on general guidelines. Since screening tests should not be carried out in some circumstances, further studies based on the concept of prevention levels proposed by Jamoulle and Roland are required for the development of strategies to prevent NCDs, including cancers. Thus, applying the concept of QP helps PCPs gain better insights into screening tests aimed at preventing NCDs and also helps improve the doctor-patient relationship by helping screenees understand medical uncertainties.

Key words: Early detection of cancer, Diagnosis, Professional-patient relations, Patient compliance, Quaternary prevention

INTRODUCTION

In the framework of the epidemiological transition first described by Omran in 1971 [1], the present period is defined as “the age of degenerative and man-made diseases.” In other words, the major diseases managed by primary care physi-
prevent early deaths by detecting certain diseases in their early stages [10,11]. In addition, screening tests are not applied to symptomatic patients, but to people who feel healthy [8,12], such that PCPs should consider harms, such as overtreatment caused by overdiagnosis and false-positive results and psychological stress, including the anxiety placed on screenees [13-16]. Moreover, ethical issues have been raised regarding screening tests that are performed without adequate evidence of their merits and demerits [17,18]. Although recent publications on screening tests have suggested tailored screening tests that consider the values and preferences of screenees [13,19,20], the aim of this paper was to develop action plans for PCPs in responding to guide their responses to the results of screening tests.

**BODY**

PCPs choose appropriate screening tests for each healthy individual, and must interpret the results correctly. In order to accomplish this, analytical frameworks for screening should be established. Numerous frameworks have been introduced according to the natural history of various diseases [8,21,22], based on the concept of secondary prevention introduced by Leavell and Clark in 1940s [23]. A troublesome situation for PCPs is when a screening test gives a negative result, and the PCP has to reduce the harms of screening, but the screenee does not accept this course of action [16]. The prevention concept defined by Leavell and Clark does not address such situations [24-26]. In contrast, the concept of quaternary prevention (QP), introduced by Jamoulle and Roland in 1995 [27], points out that all medical processes are not inherently beneficial to the patient and therefore embraces efforts to reduce harmful impacts on healthy individuals who visit PCPs. They defined QP as ‘the actions taken to identify a patient or a population at risk of overmedicalization, to protect them from invasive medical interventions, and to provide methods of care that are both scientifically and ethically acceptable’ [27-29]. Among four domains of prevention defined based on interpersonal relationships between patients and doctors, the quaternary level of prevention refers to a situation in which a patient feels ill but the doctor concludes that no disease is present (Figure 1) [26-28]. Therefore, this article summarizes situations that PCPs encounter during screening tests according to the concept of QP, and suggests measures to face such situations.

**Situations Encountered by Primary Care Physicians and Changes in Prevention Levels**

Jamoulle and Roland [27] introduced four levels of prevention corresponding to different types of interactions between medical service consumers and providers, centered on the lifelong timeline from birth to death. Whereas the prevention levels of Leavell and Clark were proposed according to the natural history of diseases with particularly syphilis natural story [24], the prevention levels articulated by Jamoulle and Roland are based on the relationships between patients and providers and emphasize variations across the life cycle of consumers [29] (Figure 1, Table 1). In particular, the fourth level of QP occurs when a PCP decides that no disease is present although the patient feels ill [26-28]. The introduction of this fourth level corresponded very well with real-world develop-

![Figure 1](https://example.com/fuzzy_limits.png)

**Figure 1.** Fuzzy limits in provider (disease) vs. patient (illness) situations. The arrow indicates nebulous and non-clear-cut scenarios in lifetime.

**Table 1.** Differential aspects of prevention levels between Leavell and Clark [23] vs. Jamoulle and Roland [27]

| Aspects                  | Leavell and Clark | Jamoulle and Roland |
|--------------------------|-------------------|---------------------|
| Based on                 | Natural history of a target disease | Lifelong timeline |
| Diseases that fit the model well | Infectious diseases | Ongoing illness |
| Shape of paradigm        | Epidemic triangle | Circular wheel |
| Mechanism                | Host-agent-environment equilibrium | Gene-socio-environmental interactions |
| Underlying condition     | Behaviors or habits | Susceptible genes, culture, or resources |
| Main targets             | Infectious organisms | Modifiable lifestyles, self-care, and health beliefs |
| Related environments     | Socioeconomic status, occupational conditions | Socioeconomic status, occupational conditions, medical insurance, healthcare delivery system |
ments towards the control of overmedicalization [29]. Moreover, as shown in Figure 1, the boundary between the presence and absence of disease are fuzzy, and the accuracy of such boundaries is subject to discussion. In other words, vagueness is the rule in health care [30] because the illness behavior of patients is conditioned by health beliefs [31], and boundaries between disease and illness are not always clear [32], particularly in mental health [33]. Thus, prevention levels may vary according to the treatment offered by providers, the demands for medical services by consumers, and variations across the life course, even for the same consumer.

In order to understand how prevention levels change according to consumers’ situations and their timelines, scenarios that PCPs may encounter during screening for breast cancer are listed in Table 2. Since a human being begins life from birth, the first level is the primary level, which includes genetic factors. The level of prevention varies widely according to the purposes of patients’ visits and the potential for several concurrent medical conditions to be present within one person [34] as multi-morbidity is increasingly the norm in the management of chronic diseases in general practice [35].

Primary Care Physicians’ Action Plans According to Screening Results

Despite serious doubts about the accuracy and efficiency of screening [10], and some confusion about the recommendations [36, 37], cancers including breast, uterine cervix, colon, and stomach are regularly screened for in the normal-risk population, according to cancer screening guidelines [38]. How a PCP should interpret and manage screening results according to the prevention level of screenees is organized in Table 3.

Preferentially, screening test results are divided into true or false, as determined by the provider who decides the prevention level of the consumer [39]. If the results come out as true positive (TP) or true negative (TN) and the consumer accepts the decision of the provider (TP1, TN1), medical judgements and shared decision-making are not hard. However, when the decisions made by the provider and the patient are different [40], even if the results come out as true negative (TN2), the patient-doctor relationship may encounter difficulties [41]. Therefore, while implementing efforts to prevent overtreatment and informing consumers of the possibility of screening errors, PCPs should try to establish and maintain trust.

For false positive (FP) and false negative (FN) results, when the consumer and provider agree on the results (TP1, FN1), they should make efforts towards “sharing decision-making” [42]. However, in situations when they decide differently (TP2, FN2), the patient-doctor relationship is likely to encounter difficulties [17]. In the case of FN2, PCPs consider to shorten screening intervals. In the case of TN2, PCPs should make their best efforts to prevent overdiagnosis and overtreatment with unnecessary screening tests [43]. In particular, stopping the screening process may be an important decision for many older adults [44].

| Types | Hypothetical scenarios | Shifting levels of activities | Hypothetical next paths |
|-------|------------------------|-------------------------------|------------------------|
| 1     | A prompt treatment for a painful breast mass | III -> III                 | -> I, III, or death   |
| 2     | Prompt management of a mass found by the SM as recommended by the PCP | I -> II -> III             | -> I, III, or death   |
| 3     | Reassurance with watchful waiting and avoiding overtreatment of a benign lesion found by the SM as recommended by the PCP | I -> II -> IV              | -> I                 |
| 4     | Prompt treatment of an evidently dangerous mass found by chance | I -> II -> III             | -> I, III, or death   |
| 5     | Valid evaluation for a palpable mass found by chance, such as an incidentaloma | II -> IV                   | -> I, III, or death   |

1 Complexity arises from the interaction of doctor and patient knowledge in different situations; In each case, poor communication skills, inattention, and/or lack of process control could make the patient remain in category IV, that is, insecure and worried.
2 The patient knows he/she has a problem (III) and the doctor accepts and provides care for it (III); The problem resolves (I), remains chronic (III), or the patient dies.
3 The patient is asymptomatic and healthy (I), and undergoes screening (III); The doctor finds and provides care for a disease (III); The patient recovers (I), the problem remains chronic (III), or the patient dies.
4 The patient is asymptomatic and healthy (I), and undergoes screening (III); The problem found is benign and the problem resolves (I), or the patient does not believe it has resolved and remains sick or worried (IV); Reassurance and good communication allow the patient to feel healthy (I).
5 The patient is asymptomatic and healthy (I), and undergoes screening (III); Early diagnosis is made by chance (II); the doctor finds and provides care for a disease (III); The patient recovers (I), the problem remains chronic (III), or the patient dies.
6 The patient has an ongoing health problem (III); The doctor unexpectedly finds a new problem unknown to the patient; that is, an incidentaloma (II) that induces anxiety in the patient (IV); Either the problem was in fact trivial and after explanation the patient does not worry anymore (I), or the patient becomes severely ill and is cared for (III); The patient recovers (I), the problem remains chronic (III), or the patient dies.
CONCLUSION AND SUGGESTION

The previous discussion has summarized how the prevention levels proposed by Jamoulle and Roland may vary according to the demands of consumers, using the example of screening tests for cancer. Additionally, suggestions have been made for how PCPs should interpret and manage screening test results. This simplification of the process improves PCPs’ insights into screening tests for preventing chronic diseases. It also underscores the depth of the complexity that PCPs must deal with [40], as well as the necessity of training future PCPs in communication skills and appropriate shared decision-making [45].

This framework also contributes to improvements in the doctor-patient relationship by facilitating the consumer’s understanding of medical uncertainty [45]. In addition, establishing proper strategies for screening tests that are carried out in primary care contexts through the implementation of QP is supportive of population-health approaches [46]. Nonetheless, immediately prior to the final diagnosis of a disease, providers should avoid binary constraints in shared decision-making, even if consumers demand a more certain decision. Instead, PCPs should provide accurate information on the characteristics of NCDs and the advantages and disadvantages of screening tests using decision aids [18,46,47].

Currently, the concept of screening tests has moved away from the terms of compliance and adherence and toward the concept of cooperation and participation or empowerment, which refers to how consumers understand suggested screening tests and make decisions based on their values [48]. Therefore, it is increasingly suggested that screening tests should be customized to fit individual characteristics instead of being based on guidelines [19,20].

As indicated by the fact that the epidemic of thyroid cancer in South Korea resulted from unnecessary screening [49],
screening tests should not be done in some circumstances [39]. Further studies based on the concept of prevention levels proposed by Jamoulle and Roland are required to develop strategies to prevent NCDs, including cancers. In addition, expanded studies on developing strategies for patients with multiple morbidities in primary care clinics are necessary.

CONFLICT OF INTEREST

The authors have no conflicts of interest with associated the material presented in this paper.

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REFERENCES

1. Omran AR. The epidemiologic transition: a theory of the epidemiology of population change. 1971. Milbank Q 2005;83(4):731-757.
2. Mathers CD, Loncar D. Projections of global mortality and burden of disease from 2002 to 2030. PLoS Med 2006;3(11):e442.
3. Hunter DJ, Reddy KS. Noncommunicable diseases. N Engl J Med 2013;369(14):1336-1343.
4. Dean E. Physical therapy in the 21st century (Part I): toward practice informed by epidemiology and the crisis of lifestyle conditions. Physiother Theory Pract 2009;25(5-6):330-353.
5. Health Quality Ontario. Continuity of care to optimize chronic disease management in the community setting: an evidence-based analysis. Ont Health Technol Assess Ser 2013;13(6):1-41.
6. Hakkarainen KM, Gyllensten H, Jönsson AK, Andersson Sundell K, Petzold M, Hägg S. Prevalence, nature and potential preventability of adverse drug events - a population-based medical record study of 4970 adults. Br J Clin Pharmacol 2014;78(1):170-183.
7. Harris M. The role of primary health care in preventing the onset of chronic disease, with a particular focus on the lifestyle risk factors of obesity, tobacco and alcohol; 2008 [cited 2016 Oct 20]. Available from: http://www.preventativehealth.org.au/internet/preventativehealth/publishing.nsf/Content/OFBE203C1C547A82CA2575290002318F/$File/commpaper-primary-hlth-care-harris.pdf.
8. Dans LF, Silvestre MA, Dans AL. Trade-off between benefit and harm is crucial in health screening recommendations. Part I: general principles. J Clin Epidemiol 2011;64(3):231-239.
9. Wald NJ. Guidance on terminology. J Med Screen 2006;13(1):53.
10. Saquib N, Saquib J, Ioannidis JP. Does screening for disease save lives in asymptomatic adults? Systematic review of meta-analyses and randomized trials. Int J Epidemiol 2015;44(1):264-277.
11. Gigenerzer G. Full disclosure about cancer screening. BMJ 2016;352:h6967.
12. Khunger M, Kumar U, Roy HK, Tiwari AK. Dysplasia and cancer screening in 21st century. APMIS 2014;122(8):674-682.
13. Pace LE, Keating NL. A systematic assessment of benefits and risks to guide breast cancer screening decisions. JAMA 2014;311(13):1327-1335.
14. Walter LC, Schonberg MA. Screening mammography in older women: a review. JAMA 2014;311(13):1336-1347.
15. Armstrong K, Moye E, Williams S, Berlin JA, Reynolds EE. Screening mammography in women 40 to 49 years of age: a systematic review for the American College of Physicians. Ann Intern Med 2007;146(7):516-526.
16. McCartney M. Margaret McCartney: cancer strategy should be led by evidence. BMJ 2015;350:h735.
17. Gates TJ. Screening for cancer: evaluating the evidence. Am Fam Physician 2001;63(3):513-522.
18. Barrett B, McKenna P. Communicating benefits and risks of screening for prostate, colon, and breast cancer. Fam Med 2011;43(4):248-253.
19. Onega T, Beaber EF, Sprague BL, Barlow WE, Haas JS, Tosteson AN, et al. Breast cancer screening in an era of personalized regimens: a conceptual model and National Cancer Institute initiative for risk-based and preference-based approaches at a population level. Cancer 2014;120(19):2955-2964.
20. Chubak J, Boudreau DM, Fishman PA, Elmore JG. Cost of breast-related care in the year following false positive screening mammograms. Med Care 2010;48(9):815-820.
21. Anhang Price R, Zapka J, Edwards H, Taplin SH. Organizational factors and the cancer screening process. J Natl Cancer Inst Monogr 2010;2010(40):38-57.
22. Young GP. Population-based screening for colorectal cancer: Australian research and implementation. J Gastroenterol Hepatol 2009;24 Suppl 3:S33-S42.
23. Leavell HR, Clark EG. Preventive medicine for the doctor in his community: an epidemiologic approach. 3rd ed. New York:
24. Clark EG. Natural history of syphilis and levels of prevention. Br J Vener Dis 1954;30(4):191-197.
25. Mahon SM. Principles of cancer prevention and early detection. Clin J Oncol Nurs 2000;4(4):169-176.
26. Bae JM. The author reply: a comment on “quaternary prevention in public health”. J Prev Med Public Health 2016;49(2):141.
27. Jamoulle M, Roland M. Quaternary prevention; 1995 [cited 2016 Feb 24]. Available from: http://www.ph3c.org/PH3C/docs/27/000103/0000261.pdf.
28. Jamoulle M. First do not harm. J Midlife Health 2015;6(2):51-52.
29. Widmer D, Herzig L, Jamoulle M. Quaternary prevention: is acting always justified in family medicine? Rev Med Suisse 2014;10(430):1052-1056 (French).
30. Sadegh-Zadeh K. Handbook of analytic philosophy of medicine. 2nd ed. Dordrecht: Springer; 2015, p. 37-46.
31. Usherwood TP. Responses to illness—implications for the clinician. J R Soc Med 1990;83(4):205-207.
32. Green AR, Carrillo JE, Betancourt JR. Why the disease-based model of medicine fails our patients. West J Med 2002;176(2):141-143.
33. Wakefield JC. The concept of mental disorder: diagnostic implications of the harmful dysfunction analysis. World Psychiatry 2007;6(3):149-156.
34. van den Akker M, Buntinx F, Metsemakers JF, Roos S, Knottnerus JA. Multimorbidity in general practice: prevalence, incidence, and determinants of co-occurring chronic and recurrent diseases. J Clin Epidemiol 1998;51(5):367-375.
35. Sinnott C, Mc Hugh S, Browne J, Bradley C. GPs’ perspectives on the management of patients with multimorbidity: systematic review and synthesis of qualitative research. BMJ Open 2013;3(9):e003610.
36. Kiviniemi MT, Hay JL, James AS, Lipkus IM, Meissner HI, Stefanek M, et al. Decision making about cancer screening: an assessment of the state of the science and a suggested research agenda from the ASPO Behavioral Oncology and Cancer Communication Special Interest Group. Cancer Epidemiol Biomarkers Prev 2009;18(11):3133-3137.
37. Boone E, Lewis L, Karp M. Discontent and confusion: primary care providers’ opinions and understanding of current cervical cancer screening recommendations. J Womens Health (Larchmt) 2016;25(3):255-262.
38. Smith RA, Cokkinides V, Brawley OW. Cancer screening in the United States, 2009: a review of current American Cancer Society guidelines and issues in cancer screening. CA Cancer J Clin 2009;59(1):27-41.
39. Maxim LD, Niebo R, Utell MJ. Screening tests: a review with examples. Inhal Toxicol 2014;26(13):811-828.
40. Plsek PE, Greenhalgh T. Complexity science: the challenge of complexity in health care. BMJ 2001;323(7313):625-628.
41. Kramer BS, Croswell JM. Cancer screening: the clash of science and intuition. Annu Rev Med 2009;60:125-137.
42. Müller-Engelmann M, Keller H, Donner-Banzhoff N, Krones T. Shared decision making in medicine: the influence of situational treatment factors. Patient Educ Couns 2011;82(2):240-246.
43. Zapka J, Taplin SH, Price RA, Cranos C, Yabroff R. Factors in quality care—the case of follow-up to abnormal cancer screening tests—problems in the steps and interfaces of care. J Natl Cancer Inst Monogr 2010;2010(40):58-71.
44. Torke AM, Schwartz PH, Holtz LR, Montz K, Sachs GA. Older adults and forgoing cancer screening: “I think it would be strange”. JAMA Intern Med 2013;173(7):526-531.
45. Gomes LF, Gusso G, Jamoulle M. Teaching and learning quaternary prevention. Rev Bras Med Fam Comunidade 2015;10(35):1-14.
46. Levesque JF, Breton M, Senn N, Levesque P, Bergeron P, Roy DA. The interaction of public health and primary care: functional roles and organizational models that bridge individual and population perspectives. Public Health Rev 2013;35(1):1-27.
47. Bae JM. Development and application of patient decision aids. Epidemiol Health 2015;37:e2015018.
48. Sieber WJ, Kaplan RM. Informed adherence: the need for shared medical decision making. Control Clin Trials 2000;21(5 Suppl):2335-2405.
49. Ahn HS, Kim HJ, Welch HG. Korea’s thyroid-cancer “epidemic”-screening and overdiagnosis. N Engl J Med 2014;371(19):1765-1767.