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Cross-national comparison of technology assessment processes

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Objectives: To compare methods and results among four health technology assessment organizations in different countries.
Methods: All assessment reports published between 1999 and 2001 by VATAP (United States), NICE (United Kingdom), CCOHTA (Canada), and AETS (Spain), were reviewed. Detailed information about the organization, the technology assessed, the methods used, and the recommendations made were collected. A descriptive analysis of the variables, as well as comparisons of means and proportions, was performed.
Results: Sixty-one reports assessing seventy-six technologies were published: nine (11.8 percent) by VATAP, thirty-nine (51.3 percent) by NICE, twenty (26.3 percent) by CCOHTA, and eight (10.5 percent) by AETS. A total of 64.5 percent of the technologies assessed were related to a high prevalence disease in the corresponding country. Most of the assessments addressed treatments (73.7 percent) and were mostly drugs (56.6 percent) and devices (23.7 percent). Most organizations used reviews of effectiveness and economic evaluations (64.5 percent), systematic reviews (21.1 percent), and original economic evaluations (36.7 percent). In 38.1 percent, the technology was recommended; the rest of the cases had no formal recommendations.
Conclusions: Critical issues for future technology assessment efforts are making assessment processes more consistent, transparent, and evidence-based; formalizing the inclusion of economic and ethical considerations; and making more explicit the prioritization process for selecting technologies for assessment and reassessment.

Keywords: Assessment process, International comparison, Coverage decisions

Formal health technology assessment (HTA) offers an appealing, evidence-based approach to help inform coverage and reimbursement decisions about medical advances. HTA is defined as the evaluation of a medical technology for evidence of its safety, efficacy, cost, and cost-effectiveness, and its ethical and legal implications, both in absolute terms and in comparison with other competing technologies (63). In recent years, the number of organizations conducting technology assessment worldwide has proliferated (35;36;64;66;67). In the United States, rapid growth of health technology assessment activities has occurred in the private sector (64;67). In Europe, HTA activities started in the 1980s, with the creation of formal assessment groups directly related to government decision making, and have been growing continuously (14;58).

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Whereas previous investigators have reviewed HTA activities in the United States and abroad (27;64;67), little empirical research has been conducted at the technology assessment level to understand the nature or impacts of different policies. Although investigators have examined aspects of the process in Australia (31;32;65), Europe (12;22), and Canada (37), there is little in the way of cross-national comparisons.

One might expect national technology assessment organizations to have similar assessment processes in terms of the types of technologies assessed and the methods used. The objective of this study was to analyze four health technology assessment organizations in the United States and abroad to investigate the extent to which this is true. In particular, we examined: (i) the types of technologies assessed, (ii) the methods used for the assessment, (iii) the reasons for the assessment, (iv) the degree of stakeholder participation, and (v) the recommendations made. We also discussed health policy implications.

METHODS

A data collection form was designed to obtain systematically the information of interest. The form included variables regarding the technology under assessment, and the assessment process (Table 1). The form was pilot tested twice. In the pilot tests, two trained readers, each with graduate education in technology assessment and economic evaluation, read the same thirteen reports, respectively, using a draft form, and then convened to review discrepancies in their findings and to improve the form's clarity.

Each technology assessed was characterized in terms of the disease category covered (coded using ICD-9 codification), the type of technology (drug, device, medical procedure, surgery procedure, or educational/behavior), its function (prevention, diagnostic, treatment, or rehabilitation), and its novelty (innovation, advance over an already existing technology, use of an already existing technology in a new indication, experimental, not yet allowed for its use, or already existing technology; Table 1).

We also coded the explicit mention of the reason for assessment, the assessment method used (e.g., randomized controlled trial, systematic review, economic evaluation, etc.), the decision (recommended, recommended with conditions, not recommended), an explicit mention of stakeholders' participation in the report, and mention of funding sources for the project.

We reviewed all reports published between 1999 and 2001 by Veterans Administration–Technology Assessment Program (VATAP, USA), National Institute for Clinical Excellence (NICE, United Kingdom), Canadian Coordinating Office for Health Technology Assessment (CCOHTA, Canada), and *Agencia de Evaluación de Tecnologías Sanitarias* (AETS, Spain). The time period of analysis was chosen to include all NICE's reports since its creation (1999), and the last complete year before starting the study (2001). The organizations were selected to reflect geographical distribution, and health policy relevance, while maintaining a degree of homogeneity in terms of including publicly funded agencies, with similar missions (Table 2).

Two readers independently read each report and completed the data collection form. A consensus meeting was held for readers to reach agreement about areas of disagreement. The organizations produced a total of sixty-seven reports during this time period: six from VATAP (83–88), thirty-one from NICE (13;17;19;20;23;26;38;40–44;47;49;50;55;56;59;61;62;69;71;76–78;80;81;89–92), eighteen from CCOHTA (16;24;34;45;46;48;51–54;60;68;72–75;93;94), and eleven from AETS (1–11). Almost all were available through their Web pages; one report was not possible to download (11); two were requested by mail (51;53); and two were excluded, because they were not technology assessment reports (i.e., catalog of publications [9], and guidelines for the elaboration of technology assessment reports [10]). The final sample comprised sixty-one reports. Because some reports (20;41;44;54;69;86;88;91;93) contained the assessment of more than one technology (e.g., drugs for Alzheimer's disease [20]) or the same technology applied to different conditions (i.e., predictive genetic testing for breast and prostate [54]), or updated information of previous reports (56;77), the unit of analysis considered was the technology rather than the report, per se, resulting in a final sample of eighty units of analysis.

We conducted descriptive analyses of the variables, as well as comparisons of means and proportions (analysis of variance, Chi-statistic). Data were stored and analyzed with SPSS 10.1 for Windows.

RESULTS

Table 3 shows the technologies assessed by each organization between 1999 and 2001. Only one, Zanamivir for the treatment of influenza, was analyzed by more than one agency (16;17). Assessments were mostly directed to technologies covering neoplasms (31 percent) and mental disorders (14 percent; Table 4).

The organizations most commonly assessed drugs (58.7 percent) and devices (22.5 percent), although there were significant differences in the types of technologies examined across organizations ($p = .000$). Most assessments focused on treatments (75 percent). In terms of novelty, assessments focused primarily on existing technologies (51 percent) as opposed to innovations or new uses of existing technologies (36 percent; Table 4).

The nature of the process differed across organizations in terms of whether the assessment resulted from a formal prioritization process, whether it included an economic evaluation, and the extent to which stakeholders participated (Table 5): VATAP and NICE always stated the reason for their assessments; NICE and CCOHTA mostly used economic

Table 1. Description of the Analyzed Variables

Topic	Variables	Description
Technology under assessment	Disease category covered	Disease category covered, coded using ICD-9 classification
	Type of technology	Either drug, device, medical procedure, surgery procedure, educational/behavior intervention, more than one, or others
	Medical/surgery function	Either prevention, diagnostic, treatment, rehabilitation, more than one, or others
	Novelty	Either: – innovation; completely new technology, allowed for its use; the report explicitly mentions that is a completely new technology, just approved and launched to the market – advance over an already existing technology; technical improvement over an already existing technology, i.e. an optical lens fabrication system (19) – use of an already existing technology in a new indication, i.e. taxanes in the treatment of advanced breast and ovarian cancer (46) – experimental; new technology in study; the report itself describes the randomized controlled trial that assesses the efficacy of the technology – not yet allowed for its use; new technology in its first stages of development – already existing technology; assessment of a technology that has been in the market for a long time – more than one, or others
Assessment process	Reason for the assessment	Explicit mention of the reason for the assessment: – prioritization process; result of a formal prioritization process – political decision; interest of the financing or planning authority – physicians' preferences – population preferences – media pressure – more than one, or others – not explicit
	Assessment method	Assessment method used: – review of randomized controlled trials – systematic review – non systematic review – review of economic evaluation studies – more than one, or others
	Outcome direction	Either: – recommended: the technology is recommended – recommended with conditions: the technology is recommended in particular groups of population, or for particular conditions – not recommended: the technology is not recommended – general comments/none recommendation: not an specific sentence encouraging or discouraging the use of the technology/there is not enough evidence to either recommend or not recommend the technology
	Additional funding	Additional sources of funding to the own resources of the HTA organization
	Stakeholders participation	Participation of stakeholders in the report, as authors, members of panels, boards, focus groups, etc.: – patients – general population – physicians – political regulators – managers – researchers – more than one, or others – not explicit

ICD-9, International Classification of Disease, 9th Revision; HTA, health technology assessment.

Table 2. Missions of the Organizations

Organization	Mission
CCOHTA	CCOHTA's mission is to encourage the appropriate use of health technology by influencing decision-makers through the collection, analysis, creation and dissemination of information concerning the effectiveness and cost of technology and its impact on health. As a national organization, we aim to facilitate information exchange, resource pooling and the coordination of priorities for health technology assessments.
AETS	The main objectives of AETS are: – To assess the different health technologies as a basis for formulating policies on technology selection and implementation in the National Health Service. – To promote the appropriate use of existing technologies. – AETS also handles teaching and training programs. National and international cooperation is also a major mandate of AETS.
NICE	The National Institute for Clinical Excellence was set up as a Special Health Authority for England and Wales on 1 April 1999. It is part of the National Health Service (NHS), and its role is to provide patients, health professionals, and the public with authoritative, robust, and reliable guidance on current "best practice." The guidance will cover both individual health technologies (including medicines, medical devices, diagnostic techniques, and procedures) and the clinical management of specific conditions. NICE offers the NHS and its patients a new service, which we intend shall earn, and retain, the confidence and respect of the community as a whole.
VATAP	VA's Technology Assessment Program (TAP) is a national program within the Office of Patient Care Services dedicated to advancing evidence based decision making in VA. TAP helps senior VA policy-makers to determine "what works" in health care by carrying out systematic reviews of the medical literature on health care technologies. TAP reviews varied health care "technologies" including: devices, drugs, procedures, and organizational and supportive systems used in health care. TAP reports can be helpful in appropriateness criteria, benefit design or modification, case management, equipment acquisition, quality management, risk management, utilization management.

Sources: CCOHTA: http://www.ccohta.ca
AETS: http://www.isciii.es/publico/drvisapi.dll?MIval=cw_usr_view_Folder&ID=38
NICE: http://www.nice.org.uk
VATAP: http://www.va.gov/vatap/

evaluation methods; and CCOHTA made the participation of stakeholders explicit in their reports.

The funding of the project was seldom mentioned: only CCOHTA mentioned funding from public grants, as well as authors with associations with pharmaceutical companies, and in one case that no conflict of interest existed (Table 5). All these differences among organizations were statistically significant.

Organizations also differed in terms of the frequency with which they recommended a technology after an assessment. VATAP, NICE, and AETS recommended the technology or recommended with conditions 33 percent, 51 percent, and 38 percent, respectively, for example. CCOHTA made general comments in 50 percent of cases and recommended against in 25 percent.

DISCUSSION

The process of HTA typically includes the identification and prioritization of the technologies for assessment; search, review, synthesis, and production of the scientific evidence; context analysis, including the analysis of the effectiveness, efficiency, and equity and legal aspects of the application of the technology in a specific context; elaboration of policy recommendations; dissemination activities; and impact analysis (29).

However, our analysis reveals significant differences in assessment processes across four large organizations. In particular, there are differences in the diseases covered, the types of technologies assessed, the technology's function and novelty, the assessment methods used, the recommendations made, and the funding of the projects.

First, the results suggest that the types of technologies assessed do not typically depend on the specific characteristics of each country and organization. For example, NICE has assessed many drugs for neoplasms, although age-standardized cancer incidence and mortality rates in the United Kingdom are not higher than those of other countries; the same is true for mental disorders in Canada (95). On the other hand, very few assessments in all four countries have targeted diseases of the circulatory or respiratory systems, that are important causes of death (95). Similarly, the types of technologies assessed also differ across organizations (e.g., VATAP and AETS assess mainly devices, while NICE and CCOHTA assess mainly drugs), for reasons that are not readily apparent.

We only found one matching assessment among organizations in the time period analyzed. This finding

Table 3. List of Technologies Assessed by NICE, VATAP, CCOHTA, and AETS between 1999 and 2001[a]

Organization	Year	Technology–condition	Outcome
NICE	1999	Coronary artery stents for the treatment of ischaemic heart disease (47)	NR
	2000	Sibutramine in the management of obesity (55)	None
	2000	Sibutramine in the management of obesity (55)	None
	2000	Gemcitabine for the treatment of pancreatic cancer (92)	NR
	2000	Temozolomide for the treatment of recurrent malignant glioma (23)	R
	2000	Donepezil for Alzheimer's disease (20)	R w/c
	2000	Rivastigmine for Alzheimer's disease (20)	R
	2000	Galantamine for Alzheimer's disease (20)	R
	2000	Laparoscopic versus open repair of inguinal hernia (89)	R
	2000	Laparoscopic surgery for colorectal cancer (90)	None
	2000	Autologous chondrocyte transplantation for hyaline cartilage defects in knees (38)	None
	2000	Zanamivir for the treatment of influenza in adults (17)	None
	2000	Interferon alfa and ribavirin in the treatment of chronic hepatitis C (71)	R
	2000	Methylphenidate for hyperactivity in childhood (43)	NR
	2000	Implantable cardioverter defibrillator for cardiac arrhythmias (59)	R w/c
	2000	Glycoprotein IIb antagonists in the medical management of unstable angina (44)	Gen com
	2000	Glycoprotein IIIa antagonists in the medical management of unstable angina (44)	Gen com
	2000	Inhaler devices for children with chronic asthma (61)	Gen com
	2000	Rosiglitazone for type 2 diabetes mellitus (42)	R
	2000	Hearing aid technology (81)	Gen com
	2000	Prophylactic removal of wisdom teeth (76)	None
	2000	Proton pump inhibitors in the treatment of dyspepsia (49)	Gen Com
	2000	Prostheses for primary total hip replacement (80)	R w/c
	2000	Taxanes (paclitaxel) for the treatment of advanced breast cancer (41)	Gen com
	2000	Taxanes (paclitaxel) for the treatment of advanced ovarian cancer (41)	R
	2000	Taxanes (docetaxel) for the treatment of advanced breast cancer (41)	R
	2000	Taxanes (docetaxel) for the treatment of advanced ovarian cancer (41)	Gen com
	2000	Liquid-based cytology in cervical screening (62)	NR
	2000	Debriding agents in treating surgical wounds healing(40)	Gen com
	2000	Cox-II inhibitors for rheumatoid arthritis and osteoarthritis (50)	Gen com
	2001	Beta interferons and glatiramer acetate for multiple sclerosis (78)	Gen com
	2001	Taxanes used in the treatment of advanced breast cancer (13)	R w/c
	2001	Fludarabine as second line therapy for b-cell chronic lymphocytic leukemia (91)	R
	2001	Fludarabine as second line therapy for b-cell chronic lymphocytic leukemia (91)	R w/c
	2001	Fludarabine as second line therapy for b-cell chronic lymphocytic leukemia (91)	Gen com
	2001	Topotecan for ovarian cancer (26)	Gen com
	2001	Paclitaxel in lung cancer (69)	R w/c
	2001	Docetaxel in lung cancer (69)	R w/c
	2001	Gemcitabine in lung cancer (69)	R w/c
	2001	Vinorelbine in lung cancer (69)	R w/c
	2001	Orlistat in the management of obesity (56)	R w/c
	2001	Pioglitazone for type 2 diabetes mellitus (19)	R
	2001	Riluzole for motor neurone disease (77)	NR
	2001	Riluzole for motor neurone disease (77)	R w/c
VATAP	1999	PET for the diagnosis of Alzheimer's disease (86)	NR
	1999	PET for the diagnosis of cancer (86)	NR
	1999	Drugs for male erectile dysfunction (88)	R
	1999	Vacuum constriction devices for male erectile dysfunction (88)	R
	1999	Penile prosthesis implantation for male erectile dysfunction (88)	R
	2000	Case management programs (84)	Gen com
	2000	Tablet splitting (87)	NR
	2000	Computerized lower limb prostheses (83)	Gen com
	2000	Optical lens fabrication system (85)	Gen com
CCOHTA	1999	Criteria for selection of adult recipients for heart, cadaveric kidney, and liver transplantation (51)	Gen com
	1999	Insulin lispro for diabetes mellitus type I and type II (75)	Gen com
	1999	Predictive genetic testing for breast cancer (54)	Gen com
	1999	Predictive genetic testing for prostate cancer (54)	Gen com
	2000	Implantable cardioverter defibrillator therapy for sudden cardiac death (53)	Gen com
	2000	Drug treatments for Alzheimer's disease: A review of published pharmacoeconomic evaluations (73)	NR

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Table 3. Continued

Organization	Year	Technology–condition	Outcome
	2000	Drug treatments for Alzheimer's disease: A review of outcome measures in clinical trials (94)	Gen com
	2000	Drug treatments for Alzheimer's disease: A comparative analysis of clinical trials (93)	NR
	2000	Drug treatments for Alzheimer's disease: A comparative analysis of clinical trials (93)	Gen com
	2000	Surveillance mammography after treatment for primary breast cancer (45)	R w/c
	2000	Cisapride in patients with non-ulcer dyspepsia (74)	None
	2001	New fluoroquinolones in community-acquired pneumonia (48)	Gen com
	2001	Leukotriene receptor antagonists for patients with mild to moderate asthma (68)	None
	2001	Novel antipsychotics for patients with attention-deficit hyperactivity disorder (24)	NR
	2001	Behavioural interventions for preschool children with autism (46)	Gen com
	2001	Novel antipsychotics in patients with bipolar disorder (72)	Gen com
	2001	Population-based cohort study of surveillance mammography after treatment of primary breast cancer (60)	None
	2001	Videoconferencing in telehealth in Canada (52)	Gen com
	2001	Zanamivir for the treatment of influenza (16)	NR
	2001	Oseltamivir for the treatment of suspected influenza (34)	NR
AETS	1999	Intraoperative radiation therapy for cancer patients (7)	Gen com
	1999	PET with fluorodeoxyglucose (FDG-PET) in neurology (8)	R w/c
	2000	Brachytherapy in the treatment of gynecological and other cancers (excluding prostate cancer) (5)	R w/c
	2000	Risks to health of silicone implants in general, with special attention to silicone breast implants (6)	Gen com
	2001	Effectiveness of special pressings in the treatment of pressure and leg ulcers (2)	Gen com
	2001	Efficacy of insulin infusion pumps. Impact on quality of life of certain patients (3)	Gen com
	2001	Shoulder arthroplasty in indications for degenerative or traumatologic processes (4)	Gen com
	2001	PET with 18FDG on clinical oncology (1)	R w/c

[a] This list contains 67 reports, and 80 assessments. The assessments that are repeated are those that were divided either because contained the assessment of more than one technology or the same technology applied to different conditions, or updated information of previous reports.
R, recommended; R w/c, recommended with conditions; NR, not recommended; Gen com, general comments; None, none recommendation; PET, positron emission tomography.

may, in part, reflect attempts at coordination among European technology assessment organizations through the International Network of Agencies for Health Technology Assessment (INAHTA) a body that, among other things, tries to ensure no duplication of assessment efforts.

Second, the data highlight the different way in which recommendations are made, with some organizations issuing general guidance, rather than mandatory decisions.

Third, the organizations generally lack explicit processes for prioritization, and they do not make explicit both why they assess what they are assessing and who participates in the assessment. NICE notes that the basis of selection includes criteria such as health benefit, significant impact on other health-related government policies (i.e. reduction in health inequality), significant impact on NHS resources, and adding value by issuing a national guideline (79). VATAP mentions the uncertainty regarding the worthiness of the technology by financing and planning bodies as the reason for the assessment. However, in general terms, there is little in the way of explicit, quantitative methods to inform the prioritization process of technologies to be assessed using societal criteria such as burden of disease, uncertainty about the effectiveness and cost-effectiveness of the intervention, and potential benefits and impact of the assessment (33;57;70). On the same line, there is not explicit mention about any political deliberation that leads to the assessment of certain technologies and the participation of stakeholders in any step of the process, steps that are key for an open, systematic, and unbiased decision making (30;33).

Fourth, organizations differ in the extent to which they include economic evaluation. The idea of using cost-effectiveness to inform coverage and reimbursement decisions has gained popularity (21). But our results showed continued variation in the methods used (18). In particular, only NICE and CCOHTA regularly use economic evaluation studies in their assessments.

The main limitation of this analysis is the small sample of organizations used. Organizations were selected to reflect geographical distribution and health policy relevance, while maintaining a degree of homogeneity in terms of including publicly funded agencies, with similar missions. They are not representative of the entire health technology assessment community, although they are well known and play an important role in coverage decisions in their respective countries. Nonetheless, the sample is big enough to show a lot of variability in a process—technology assessment—that, apart

Table 4. Frequencies Distribution of the Variables Regarding the Technology under Assessment, and Its Outcome[a]

	VATAP	NICE	CCOHTA	AETS	TOTAL
Disease category covered					
Neoplasms	1	17	4	3	25
Mental disorders	1	3	7	—	11
Endocrine, nutritional, and metabolic diseases	—	5	1	1	7
Diseases of the circulatory system	—	4	1	—	5
Infectious and parasitic diseases	—	2	3	—	5
Diseases of the musculoskeletal system	—	4	—	1	5
Diseases of the nervous system, sense organs	1	3	—	1	5
Diseases of the genitourinary system	3	—	—	—	3
Others	3	5	4	2	14
Total	9	43	20	8	80
Type of technology					
Drug	1	35	11	—	47
Device	6	4	2	6	18
Medical procedure	—	—	3	2	5
Surgery procedure	1	4	—	—	5
Educational, behavior	—	—	3	—	3
Others	1	—	1	—	2
Total	9	43	20	8	80
Function					
Treatment	5	39	12	4	60
More than one	2	—	4	1	7
Rehabilitation	1	—	2	2	5
Prevention	—	2	2	—	4
Diagnosis	1	2	—	1	4
Total	9	43	20	8	80
Novelty					
Already existing	5	21	8	7	41
New use of an existing technology	—	14	6	—	20
Innovation	3	5	1	—	9
Advance over an existing technology	1	1	4	1	7
Experimental	—	2	1	—	3
Total	9	43	20	8	80
Outcome					
Recommended	3	10	1	—	14
Recommended with conditions	—	11	1	3	15
Not recommended	3	4	5	—	12
General comments	3	11	10	5	29
None recommendation	—	7	3	—	10
Total	9	43	20	8	80

[a] Diseases were grouped using a modification of the categories of the International Classification of Diseases, 9th Revision.
Note: All the differences in the proportions shown are statistically significant.
For abbreviations, see Table 2.

Table 5. Health Policy Issues Dealt with in the Assessments

Topic	VATAP	NICE	CCOHTA	AETS
Is the assessment the result of a formal prioritization process?	✓	✓	✗	✗
Is the assessment the result of a political decision?	✓	✗	✗	✗
Did the assessment include economic evaluation methods?	✗	✓	✓	✗
Did any stakeholders participate in the assessment?	✗	✗	✓	✗
Did the assessment include additional funding besides the own resources of the organization?	✗	✗	✗	✗

For abbreviation, see Table 2.

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from the adaptation of the technology to the local context, is supposed to be standard, and lack of explicitness, something that is so important in a process related to the inclusion of new technologies in a health-care system.

Researchers have identified a series of relevant issues in the dissemination of HTA results such as barriers to change, timing, assessment of target groups, and credibility of both the message and the messenger (28). There is evidence suggesting that the simple diffusion of information is not sufficient to promote the application of research results in clinical practice (15) and that more research is needed on the effectiveness of different dissemination tools among citizens, politicians, and mass media (28).

Others have emphasized the importance of social, political, and ethical aspects of health technology (39). Often, policy decisions will be made on this basis of a trade-off between the evidence available on clinical and cost-effectiveness, and several other considerations, including political pressures, availability of funding, or patient and caregiver opinion. The challenge under these circumstances is to maintain transparency and consistency of the decision making process in the face of these factors, in both the public and private sector (25;29).

POLICY IMPLICATIONS

We recommend that decision-makers make explicit why a particular technology is assessed, who participates in the assessment process, what determines the decisions, the sources of founding of each project the prioritization process, and recommendations for further research. Medicare officials in the United States in particular should consider these issues as they seek to improve the coverage process, in terms of length of time required to make coverage decisions and the explicitness and openness of the process (82).

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