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Article

Assessing face validity of the HexCom model for capturing complexity in the clinical practice: a Delphi study.

Xavier Busquet-Duran [1,2,3,*], Eva Maria Jiménez-Zafra [1], Magda Tura-Poma [1], Olga Bosch-de la Rosa[4], Anna Moragas-Roca[1], Susana Martin Moreno[1], Emilio Martínez-Losada[1], Silvia Crespo-Ramírez[4], Lola Lestón-Lado[1], Núria Salamero-Tura[1], Joana Llobera-Estrany[1], Núria Oriol-Peregrina[5], Eduard Moreno-Gabriel[2,6], Josep Maria Manresa-Domínguez[2,6,7], Pere Torán-Monserrat, Pere[2,6]

1 Home Care Program. Granollers Support Team (PADES). Vallès Oriental Primary Care Service. Catalan Health Institute. 08520 Granollers. Barcelona. Spain; xbusquet@umanresa.cat, ORCID 0000-0003-2441-2651 (X.B-D.); evajiza@gmail.com, ORCID 0000-0003-2603-2847 (E.M. J-Z); turapoma@hotmail.com, ORCID 0000-0003-3835-9636 (M. T-P); amoragas_roca@hotmail.com, ORCID 0000-0003-1606-3607 (A. M-R.); susmartin0@hotmail.com, ORCID 0000-0002-1288-7046 (S.M.M); emlosada1974@gmail.com, ORCID 0000-0002-1471-0404 (E. M-L.); estonlola@gmail.com, ORCID 0000-0002-4920-4560 (L. L-L.); nsalamero.mn.ics@gencat.cat, ORCID 0000-0002-6656-0866 (N. S-T.); olloes@hotmail.com, ORCID 0000-0002-8068-4515 (J.LL-E.).

2 Multidisciplinary Research Group on Health and Society (GREMSAS). (2017 SGR 917). 08007 Barcelona. Spain; emoreno@idiapjgol.info, ORCID 0000-0001-8184-6232 (E.M-G.); jmanresa@idiapjgol.info, ORCID 0000-0001-8306-5798 (J.M.M-D.); ptoran.bnm.ics@gencat.cat, ORCID 0000-0002-9865-7427 (P.T-M.).

3 Nursing Department. Fundació Universitària Bages (FUB). University of Vic. 08500 Vic. Barcelona

4 Red Cross Psychosocial Care Team (EAPS). 08402 Granollers. Barcelona. Spain. olga.bosch@creuroja.org, ORCID 0000-0002-8326-7039 (O.B-DLR.); silvia.crespo@creuroja.org, ORCID 0000-0001-6403-5227 (S. C-R.)

5 Department of Speech Therapist. Fundació Universitària Bages (FUB). University of Vic. 08500 Vic. Barcelona, Spain; noriol@umanresa.cat, ORCID 0000-0002-9440-4174.

6 Research Support Unit Metropolitana Nord. Primary Care Research Institut Jordi Gol (IDIAPJGol). 08303 Barcelona. Spain. Barcelona.

7 Nursing Department. Faculty of Medicine. Universitat Autònoma de Barcelona. 08193 Barcelona. Spain.

* Correspondence: xbusquet@umanresa.cat

Abstract: Capturing complexity is both a conceptual and a practical challenge in palliative care. The HexCom model has proved to be an instrument with strong reliability and valid for describing the needs and strengths of patients in home care. In order to explore whether it is also perceived to be helpful in enhancing coordinated and patient-centered care at a practical level, a methodological study was carried out to assess the face validity of the model. Particularly, a Delphi method involving a group of 15 experts representing the full spectrum of healthcare professionals involved in palliative care was carried out. The results show that there is a high level of agreement, with a Content Validity Index-Item greater than 0.92 both with regard to the complexity model and the HexCom-Red, HexCom-Basic and HexCom-Clin instruments, and higher than 0.85 regarding the HexCom-Figure and the HexCom-Patient instruments. This consensus confirms that the HexCom model and the different instruments that are derived from it are valued as useful tools for a broad range of healthcare professional in coordinately capturing of complexity in healthcare practice.

Keywords: Palliative care; Delphi technique; Needs Assessment; Home Care Services; coordinated care; complexity; methodological study.

1. Introduction

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Due to the inclusion of all groups of pathologies within the scope of palliative care [1,2] and the incessant aging of the population [3], substantial growth is expected in the demand for this healthcare services in the upcoming years [4]. In the Spanish context, it is considered that 1.5% of the population and 11% of people over 65 need palliative care [5–7]. This progressive and quantitative increase brings along a sophistication of this demand. Accordingly, experts agree that the backbone of palliative care must be the notion of complexity [8–11]. However, capturing complexity is both a conceptual and a practical challenge in palliative care [11].

The very nature of "complexity" is controversial [12]. This is partly due to the fact that it emerges from the concurrence of multiple interrelated factors, whether they are clinical, contextual or related with the health system [13]. In an attempt to enhance the concept's applicability and endorse a patient-centered clinical practice, a number of systemic theoretical frameworks have been developed and adopted over the last few years in the field of palliative care. The cumulative model puts the focus on the imbalance between the burdens and responsibilities of the patient on the one hand and their capacities on the other [14]. The vector model focuses on contextual factors, namely the interrelation and balance between socio-economic, behavioural, genetic, environmental, cultural and socio-political factors [5, 15, 16]. Finally, drawing on Bronfenbrenner's ecological systems theory, Pask et al. [11] offer an innovative framework for understanding complexity, emphasizing the natural ecological environment of the individual, which is formed by the set of relationship structures that accommodate him/her.

Particularly in the practice of home care, foregrounding the patient's specific needs and seeing them in relation to a broader and specific context should facilitate providing timely, adequate, individualized and coordinated care [12,17]. Likewise, managing patients' profiles drawing on their specific needs should assist in identifying those in need of specialized palliative care [11,18].

To the best of our knowledge, there are not available validated instruments based on this systemic approach, neither at a national level [19–23] nor at the international level [24,25,34,26–33]. To overcome this deficit, between 2006 and 2017 a model (HexCom) has was designed to ultimately aid healthcare professionals caring for people with advanced illness and/or at the end of life.

Originally, this model draw on the complexity levels and the inclusion and referral criteria for palliative care patients defined by the Catalan Government drawing on the conclusions of an interdisciplinary and multilevel work group endorsed by the Catalan Scientific Societies for Palliative Care and Family Medicine and Community [35]. Based on Ferris [36], the model proposes six areas of needs: clinical, psycho-emotional, social/family, spiritual, ethical and death-related. For each area, the level of complexity may be categorised as low (L), medium (M) or high (H).

Recently, based on Pask et al. [11], the model has been complemented adding five areas of systemic strength: micro-system, meso-system, chrono-system, exo-system and macro-system. For each system the strength level can also be qualified as low, medium, or high. As a result of contrasting identified needs and strengths, an intuitive balance of complexity is proposed, emerging from considering whether a large amount of systemic strength may or may not reduce the resulting degree of complexity. The model has been published [37] and its content partially validated [38], with an inter-observer Kappa of 0.92. The first results of its application in clinical practice have also been published recently [39].

Even though referrer professionals in hospitals and primary care are ultimately in charge of detecting cases with complex needs, palliative care is a basic responsibility of all healthcare professionals [12]. Accordingly, HexCom is deployed in five instrumental versions, which are complementary, suited to the degree of specialization of the service using it and the objective pursued (see Table 1 and Supplementary Materials S1 and S2).

Table 1. Instruments derived from the HexCom Model

HexCom	Format	Needs	Strengths	HC Professional End-users

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Red	Table	6 areas	-	Generalists.
Basic	Table	6 areas	5 systems	Specialists with basic equipment.
Clin	Table	6 areas subdivided into 18 sub-areas	5 systems subdivided into 9 sub-systems	Specialists With full set-up.
Figure	Figure	6 areas subdivided into 18 sub-areas + evaluation at the beginning	5 systems subdivided into 9 sub-systems	Specialists with complete resources & training.
Patient	Table	6 areas + 1 open question	5 areas + 2 open questions	Specialists.

Given this diversity of tools and professionals involved in complexity assessment, besides the need to achieve coordinated and patient-centred care in palliative care, it is critical to evaluate whether these instruments are consensually perceived, by a broad range of healthcare professionals, as valuable resources for their job of capturing the degree of complexity of all patient's needs [40]. Hence, this study aims at assessing the face validity of both their Catalan and Spanish versions of the model and its derived instruments.

2. Materials and Methods

This study has been conducted and reported following the recommendations for the Conducting and REporting of DElphi Studies (CREDES) [41].

2.1. Design of the study

The present is a methodological study using a Delphi process to systematically evaluate the face validity of HexCom model and its 5 instruments.

Delphi is a technique for determining the level of formal consensus and is used to obtain and evaluate the opinions of a group of experts with knowledge and experience in a specialized field [42–44]. In this case, the participants are considered experts in so far as they have knowledge and experience in delivering palliative care, therefore being capable of assessing whether the HexCom model is appropriate to the targeted construct (i.e complexity) and assessment objectives (i.e. identify complex patients/situations and allocate resources accordingly) [45]. The method structures a group communication process that is effective in allowing a group of individuals, as a whole, to address a complex issue [46]. The qualitative and quantitative approaches are combined into a single procedure, mitigating their respective limitations [47]. It entails the administration of questionnaires in different rounds until consensus is reached [42]. This method guarantees anonymity, controlled feedback and a systematic assessment of face validity by way of an iterative process and the use of statistical techniques [48,49].

The procedure, including the previous stages of the HexCom model development, is shown in figure 1. The two stages belonging to the Delphi Study reported in this article are detailed below: 1)

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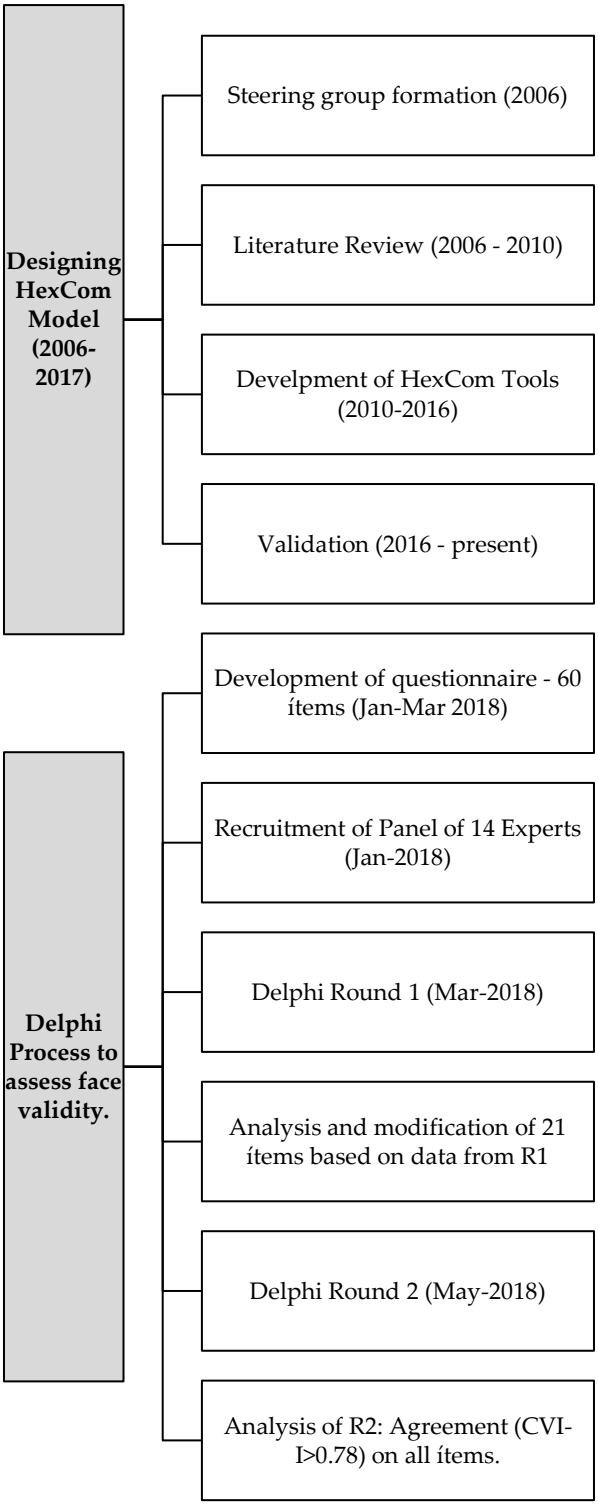
the preparation of the questionnaire by a coordinator-administrator group and 2) the consensus methodology with a panel of experts.

Figure 1. Process of Development and Validation of HexCom



2.2. Preparation of the questionnaire:

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The coordinator-administrator group was formed by the core members of PADES in Granollers, a Home and Palliative Care Support Team consisting of professionals with different backgrounds and a longstanding experience in palliative care and home care (see Table 2 for a detailed description).

Table 2. Characteristics of the coordinating group

Coordinator Group (n=11)	
Age	
From 29 to 45 years	8 (72.7%)
From 45 to 63 years	3 (27.2%)
Average (Standard Deviation)	*45.8 (8.8)*
Gender	
Women	9 (81%)
Men	2 (19%)
Profession	
Nursing	4 (36.3%)
Medicine	3 (27.2%)
Social Work	2 (18.1%)
Psychology	2 (18.1%)
Years of professional experience	
From 7 to 10	2 (18.1%)
From 11 to 20	4 (36.3%)
From 21 to 39	5 (45.4%)
Average (Standard Deviation)	*19.3 (8.0)*
Years of palliative experience	
From 7 to 10	2 (18.1%)
From 11 to 20	6 (54.5%)
From 21 to 39	3 (27.2%)
Average (Standard Deviation)	*17.1 (8.9)*
Years of home care experience	
From 1 to 10	6 (54.5%)
From 11 to 20	2 (18.1%)
From 21 to 39	3 (27.2%)
Average (Standard Deviation)	*13.6 (10.8)*
Experience in Teaching and Research	
Graduate Teaching	6 (54.5%)
Postgraduate Teaching	7 (63.6%)
Publications	9 (81.8%)

Drawing on their expertise and the existing literature [50,51], the coordinator-administrator group defined the panel of experts, designed the assessment questionnaire and provided feedback to the panel.

Based on Oriol-Peregrina [52], the questionnaire contains a total of 60 statements or questions regarding the form, content, utility and clarity of the HexCom model and its different versions (see Appendix 1). More specifically, questions refer to: the model (questions 2–15), Red (q. 16–23), Basic (q. 24–32), Clin (q. 33–38), Figure (q. 39–45), Patient (q. 46–59), the clarity of the translation into Spanish and its correspondence with the original Catalan version (60) and one last open question to collect generic qualitative feedback on the model or any of the instruments. Participants were asked to provide their degree of agreement with each statement using a Likert scale [39, 40] including the following grades: 1 = "Strongly disagree", 2 = "Disagree", 3 = "Indifferent", 4 = "Agree", and 5 =

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"Strongly agree". All items included a blank space to allow explanatory comments, and suggested modifications (e.g. alternative wording of a given item).

2.3. Delphi Process

The Delphi technique has been widely used in palliative care [53]: the first areas where it was used were those of oncology pain [44] and it has been used specifically to assess complexity [54].

2.3.1. Participants and setting

The number of participating experts recommended in the literature is between 7 and 30 [55,56]. Due to the small number of participants, the method is not intended to produce statistically significant results, but to collect the synthesis of thought from a special group [48].

The panel of experts was assembled using a purposive sampling process following as a selection criteria their knowledge and experience in palliative and home care, as well as making sure it included the full scope of professions that are involved in end of life care, at all levels of care (i.e. primary, secondary, etc.). Following established recommendations [40, 41] for this procedures, 15 people were selected, with the additional inclusion criteria of having over 8 years of experience in palliative care. Criteria for exclusion consisted of being currently unemployed, retired or exempt of actual clinical practice for any given reason and having participated in the development of the HexCom model or any of its instruments.

2.3.2. Data Collection

After the questionnaire was designed between January and March 2019, the experts were reached out in March 2019 in order to explain present them the project and ask for their participation. In case of acceptance, a personalized explanatory letter was sent by email, including a link to access the virtual anonymous platform containing complementary documentation, the different versions of the instrument (see Supplementary Materials 1 & 2) and the questionnaire.

2.3.3. Ethical Considerations

The participants were informed about the project's objectives, indicating that the participation was voluntary and that the information was collected in an anonymous database so they could not be identified. The study was approved by the Ethics Committee of the IDIAP Fundació Jordi Gol (Ref. P15/171), the official institutional review board for primary care research in Catalonia.

2.3.4. Data Analysis

To assess the degree of consensus after each round, the scores were analysed using the Content Validity by Item Index (CVI-I), and the number of experts that showed some disagreement. CVI-I allows assessing quantitatively the degree of agreement amongst experts on a given item, dividing the number of experts agreeing (scoring 4 or 5) with a given item by the total number of experts responding to that question [57]. Following the American Educational Research Association recommendations for studies with a panel of 6 or more experts, a CVI-I of over 0.78 was interpreted as significant consensus [42, 43]. After obtaining and analysing the results of the previous round, those items with a CVI-I under 0.78 and/or where three or more experts expressed disagreement were re-submitted in a second and final round [38, 45]. Based on Varela et al. [61], the qualitative data obtained in the first round was used in the second round to modify the item in question (see Appendix 2).

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3. Results

3.1. Description of the Panel of Experts

A description of the panel of experts whose participation was sought id displayed in Table 3. 14 of the 15 invited professionals accepted to take part of the study (93%). The average age of the panel was 52.3 years, with all professions at all levels represented, extensive work experience on average (24.8 years), including long experience both in palliative care (18.1 years) and home care (13 years), as well as having teaching and research experience in the subject (see table 3).

Table 3. Characteristics of the Expert Panel

Panel of Experts (n=14)	
Age	
From 29 to 45 years	4 (28.6%)
From 45 to 63 years	10 (71.4%)
Sex	
Female	10 (71.4%)
Male	4 (28.6%)
Profession	
Nursing	3 (21.4%)
Medicine	5 (35.8%)
Social Work	3 (21.4%)
Psychology	3 (21.4%)
Place of current work	
Social Healthcare	4 (28.6%)
Primary Care	3 (21.4%)
PADES	6 (42.8%)
University	1 (7.1%)
Years of professional experience	
From 7 to 10	0 (0%)
From 11 to 20	5 (35.7%)
From 21 to 39	9 (64.3%)
Years of palliative experience	
From 7 to 10	4 (28.6%)
From 11 to 20	3 (21.4%)
From 21 to 39	7 (50%)
Years of home care experience	
From 1 to 10	8 (57.1%)
From 11 to 20	1 (6.6%)
From 21 to 39	5 (33.3%)
Teaching and Research experience	
Graduate	8 (57.1%)
Postgraduate	12 (85.7%)
Publications	13 (92.8%)

3.2. Delphi Survey

The results of the first and the second Delphi Rounds are shown in Table 4. Even though in 54 of the items (90%) the defined threshold for assuming consensus was achieved in the first round, all of those which received critical commentaries or appropriate suggested modifications (15 items) were revised, modified and re-submitted for validation in the second round, alongside those 6 items

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scoring sub-optimal CVI-I (<0.78) in the first round. All items scored above 0.78 CVI-I in the second and final round.

Table 4. Expert answers rounds 1 and 2, with average, standard deviation (SD), number of experts in disagreement, and the Content Validity by Item Index (CVI-I)

	Round 1				Round 2			
Item	N	Average (SD)	Experts not in agreement (N)	CVI-I	N	Average (SD)	Experts not in agreement (N)	CVI-I
Model								
2	14	4.71 (0.47)	0	1	14			
3	14	4.71 (0.47)	0	1	14	4.47 (1.06)	0	1
4	14	4.71 (0.47)	0	1	14			
5	14	4.86 (0.36)	0	1	14			
6	14	4.21 (0.58)	1	0.93	14			
7	14	4.71 (0.47)	0	1	14			
8	14	4.57 (0.51)	0	1	14			
9	14	4.57 (0.51)	0	1	14			
10	14	4.57 (0.51)	0	1	14			
11	14	4.29 (0.61)	1	0.93	14			
12	14	4.36 (0.50)	0	1	14			
13	14	3.86 (0.66)	2	0.86	14	3.80 (0.88)	1	0.93
14	14	4.50 (0.52)	0	1	14	4.13 (0.99)	0	1
15	14	4.14 (0.66)	2	0.86	14	3.87 (0.83)	0	1
HexCom-Red								
16	14	4.64 (0.50)	0	1	14			
17	14	4.36 (0.63)	1	0.93	14			
18	14	3.93 (0.73)	4	0.71	14	3.93 (1.11)	1	0.93
19	14	4.14 (0.53)	1	0.93	14			
20	14	4.14 (0.53)	1	0.93	14			
21	14	4.14 (0.77)	3	0.79	14	3.92 (1.06)	2	0.86
22	14	4.36 (0.93)	2	0.86	14	4.40 (1.07)	1	0.93
23	14	4.21 (0.43)	0	1	14			
HexCom-Basic								
24	14	4.57 (0.51)	0	1	14			
25	14	4.29 (0.83)	1	0.93	14			
26	14	4.14 (0.86)	2	0.86	14	3.86 (1.07)	1	0.93
27	14	4.21 (0.58)	1	0.93	14			
28	14	3.93 (1.00)	3	0.79	14	3.86 (1.07)	1	0.93
29	14	4.00 (0.68)	3	0.78	14	3.85 (1.04)	3	0.78
30	14	4.14 (0.53)	1	0.93	14			
31	14	4.14 (0.77)	1	0.93	14			
32	14	4.00 (0.96)	4	0.71	14	3.87 (0.83)	0	1
HexCom-Clin								
33	14	4.57 (0.51)	0	1	14			
34	14	4.36 (0.84)	1	0.93	14			
35	14	3.57 (1.16)	5	0.64	14	3.92 (1.13)	2	0.86
36	14	4.29 (0.47)	0	1	14			
37	14	4.00 (0.78)	2	0.86	14	3.93 (0.88)	0	1
38	14	4.14 (0.86)	2	0.86	14	3.79 (0.90)	2	0.86
HexCom-Figure								
39	14	4.57 (0.51)	0	1	14			

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40	14	4.29 (0.47)	0	1	14			
41	14	3.93 (0.92)	4	0.71	14	3.66 (0.85)	2	0.86
42	14	3.79 (0.89)	5	0.64	14	3.87 (0.83)	0	1
43	14	4.07 (0.27)	0	1	14	3.87 (0.83)	0	1
44	14	3.64 (0.84)	4	0.71	14	3.72 (0.83)	2	0.86
45	14	4.36 (0.63)	1	0.93	14			
HexCom-Patient								
46	14	4.50 (0.52)	0	1	14			
47	14	4.50 (0.52)	0	1	14			
48	14	4.29 (0.61)	1	0.93	14			
49	14	4.36 (0.63)	1	0.93	14			
50	14	4.21 (0.80)	1	0.93	14	3.93 (0.88)	0	1
51	14	4.29 (0.47)	0	1	14			
52	14	4.29 (0.47)	0	1	14			
53	14	4.29 (0.61)	1	0.93	14			
54	14	4.15 (0.80)	1	0.92	14			
55	14	4.21 (0.70)	2	0.86	14	4.12 (1.15)	2	0.86
56	14	4.71 (0.47)	0	1	14			
57	14	4.86 (0.36)	0	1	14			
58	14	4.14 (0.53)	1	0.93	14			
59	14	4.00 (0.55)	2	0.86	14			
Translation								
60	14	4.07 (0.83)	2	0.86	14	4.13 (0.99)	0	1

3.2.1. The HexCom Model

As shown in table 4, all items (2-15 and 60) assessing the model and its perceived usefulness reached the established degree of consensus in the first round (CVI-I>0.86) which increased in the second round (CVI-I>0.92) after modifying 4 items drawing on the commentaries received from the panel. According to the qualitative feedback received, this very high consensus stems mainly from two key elements. On the one hand, the sound conceptual underpinnings of the model: that complexity must be based on changing needs as the backbone of palliative care and the usefulness of a systemic approach to evaluate both needs and strengths in a given case. On the other hand, though slightly less significant, the Model's perceived transferability to all levels of care and, ultimately, the general public.

3.2.2. HexCom instruments

After adjusting those formal aspects (Item 18) suggested by the panel between rounds, HexCom-Red exceeded 0.92 in CVI-I for all items in the second round, except in the item (21) relating to the explanatory wording. Nevertheless, agreement upon this item improved from 0.79 in the first round to 0.86 in the second.

Similarly, HexCom-Basic exceeded 0.92 in the CVI-I scores for almost all items in the second round (improving the scores in 3 of 4 items modified and resubmitted in the second round). Item 29, which refers to the explanatory wording for each area of systemic strengths is an exception to this trend. This scored a CVI-I of 0.78 in the first round and did not improve in the second round. This was partly due to the fact that three experts responded "indifferent" in the first round but did not provide alternatives to the wording.

All items regarding HexCom-Clin achieved the established degree of consensus, scoring 0.86 or above in the CVI-I of all items considering both round 1 and 2. After registering insufficient degree of consensus in the first round, Item 35 (referring to the instrument's format) was modified and validated in the second round, where it scored a CVI-I of 0.86. Item 38, asking about non-specialists'

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understanding of the instrument was resubmitted with modifications in the second round, where it scored 0.86 in CVI-I, as in the first round.

In the first round, the panel of experts assigned rather low scores to formal aspects (Item 41) and content issues (Item 42 and 44) of the HexCom-Figure. However, after the suggested modifications were introduced between rounds, all items exceeded 0.85 of the CVI-I score.

All questions about the HexCom-Patient received were agreed upon in the first round, scoring CVI-I's over 0.85. Even though two items were resubmitted in the second round after introducing minor modifications to the instruments, the overall degree of agreement increased slightly (1 item reached a CVI-I of 1).

3.2.3. Open comments

The majority of the responses given to the final open question did not refer to the model or the instruments' contents but to the difficulties of implementing them in non-specialized environments. These included comments on great care pressure, time constrains (both at primary care and hospital levels), fragmented work dynamics and, as this expert puts it: "the need for awareness, information and specific training and practice". In sum, the HexCom model is perceived as a good instrument for research in as much as "the model proposes an approach from 'the whole', taking into account all aspects that need to be considered, which facilitates monitoring and decision making". Some experts point out the "perils" of forgetting that, before administering the instruments, it is necessary to create a bond and respond to emerging needs.

4. Discussion

Establishing a consensus on the complexity of care in a field of clinical practice such as palliative care is not exempt from difficulties [62]. Aspects such as the elements that make it up, the criteria that define it, the best tools for detection and management or its adaptation to a certain healthcare field are still controversial [63]. Thus, studies using the Delphi method in palliative care [43] [64] reach levels of agreement lower than in other fields, where up to a 100% of consensus is achieved in all items in the second round.

In our study, a group of highly qualified experts in palliative care reached an agreement that exceeds 92% with respect to the face validity of the HexCom model, and more than 86% in relation to the utility of the different instruments that result from it.

It can be argued that this high degree of consensus is associated with the systemic approach [11] underlying the HexCom model, which allows the detection of unmet needs and understands complexity not only as a multidimensional construction, but also a multi-referential construction, taking into account the training of the diverse healthcare teams involved in complexity assessment [33].

The HexCom model is aligned with the majority of instruments validated both internationally [24–27,29,65], as well as in the context of Spain [32], yet its high perceived usability may be explained by its capacity to broad the scope of application beyond oncological and hospitalized patients [37][38][39].

Arguably, HexCom is appreciated by a wide range of professionals insofar as it improves the responsiveness of instruments such as the PCSPS (Palliative Care Problem Severity Score), which only considers 4 areas and refers to features closer to assessing severity rather than complexity [25]. It can also be argued that HexCom is perceived to present certain advantages with respect to the Needs Assessment Tool (NAT: PD-C) [29–31,65] since the former introduces a specific ethical area. Given that the HexCom model identifies complexity on every case where at least one of its dimensions is defined as highly complex, it can be argued that it is valued as more sensitive than similar tools such as PALCOM [32,33], which identifies a patient's complexity only as a result of a summation of all of its areas. Similarly, it may be perceived as more patient-oriented than IDC-PAL® in as much as it is based on patients needs, rather than a set of risk factors [19–21].

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Limitations of the study

A limitation in the Delphi technique is the bias risk in selecting the group of experts. The homogenization criterion (having expertise in home care) may have produced an approach with little representation, potentially limiting the breadth of experience included in the panel. To overcome this threat, the coordinating group consisted of a multidisciplinary group, with extensive and divergent experience, including psychologists and social workers, who are often not represented in other validation processes. However, the elevated interest in participating in the study (93% of the invitees participated) suggests that the participants are very representative of this professional community [56,66]. Even though heterogeneity between this sample was sought by including the different professions involved in home care, it could have been greater if patients and relatives had been somehow involved in the study [64]. Another potentially problematic issue when carrying out Delphi studies is the way in which consensus is defined and operationalized, since it varies considerably amongst different studies [60], particularly in face validity studies. To address this limitation, a quantitative criteria and established recommendations were followed (CVI-I and the number of experts in disagreement) combined with qualitative data to understand disagreement and enhance the consistency of the final results [46].

5. Conclusions

This study stems from the need to establish a shared understanding and widely accepted tools for capturing complexity as a critical step towards enacting coordinated and patient-oriented palliative care [32]. At a conceptual level, the HexCom model fulfils the prerequisites proposed by Pask, outlined drawing on patient and professionals' experiences, in order to capture complexity [11]. These entail addressing it systematically; understanding the person as a whole; addressing it at the patient level (in a personal clinical visit and collecting clinical data); identifying needs and resources (resilience and support networks included); defining levels of complexity and using sensitive instruments that facilitate concrete interventions. This study complements the model's robustness by validating HexCom face validity for the broad majority of its targeted end-users, namely healthcare professionals from different backgrounds. These positive results consolidate the broader project of validating this model, which will be followed by assessing the test-retest reliability, validity of criteria, concomitant and predictive reliability, as well as sensitivity and feasibility [67]. Accordingly, HexCom model is expected to be increasingly and widely adopted as s shared and valuable tool for needs assessment in palliative care.

Supplementary Materials: The following are available online at www.mdpi.com/xxx/s1,

Author Contributions: Author Contributions:

"Conceptualization, XBD, EMJZ, NOP; methodology, EMG, NOP; software, JMMD; validation, EMG and NOP.; formal analysis, JMMD, XBD; investigation, AMR, SMM, JLLE, XBD; resources, PTM, NST; data curation, EML, XBD; writing—original draft preparation, SCR, XBD; writing—review and editing, EMG, LLL, XBD; visualization, MTP; supervision, OBR, PTM; project admin PTM. All authors have read and agreed to the published version of the manuscript."

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Conflicts of Interest: The authors declare no conflict of interest.

Appendix A: Questionnaire to evaluate face validity of the HexCom model and the different associated instruments for complexity assessment.

		SD(1)	D(2)	I(3)	A(4)	SA(5)
	MODEL					
2	The backbone of palliative care has to be the level of complexity.					
3	Complexity is determined by the needs and resources of the patient-family unit and by the decisive capacity of the service that serves them.					
4	The HexCom model proposes a systematic approach to complexity, understanding the person as a whole, and at the same time collecting needs and resources.					
5	The division in six areas that HexCom makes for the needs of the patient/family: clinical, psycho-emotional, spiritual, socio-family, ethics and death-related.					
6	Dividing patient/family resources into five systemic areas: micro-system, meso-system, chrono-system, eco-system and macro-system.					
7	The grading of levels of complexity proposed by the model (low, medium and high).					
8	HexCom's proposal for intervention (a benchmarking team for low complexity, specialized team with intensity agreeing with the average complexity and specialized team with high intensity for high complexity).					
9	HexCom as a model of care can favourably affect the quality of care for people with advanced illness and/or at the end of life.					
10	The use of HexCom favours teamwork by offering a common language between different disciplines.					
11	The content of HexCom is understandable by the professionals of the different disciplines that intercede in palliative care.					
12	The use of HexCom helps strengthen consensus among professionals involved in the care of the case.					
13	The content of HexCom is understandable by non-specialized persons in palliative care.					
14	The different instruments that are deployed from the model can respond to the whole range of needs that can be found in the different services/teams.					
15	The model seems applicable to all healthcare levels.					
	HEXCOM-RED					

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16	HexCom-Red as a tool for the management and derivation of complex cases can favourably affect the management of care for people with advanced and/or end-of-life illness.					
17	HexCom-Red offers information in a clear and visual way.					
18	The format of HexCom-Red is adequate in terms of letter type, measurement and distribution of information in space.					
19	The distribution of information in the grid of HexCom-Red facilitates it being filled in easily.					
20	The content of HexCom-Red is adequate in terms of its extent.					
21	The explanatory drafting for each area of HexCom-Red is clear enough and understandable for people not specialized in palliative care.					
22	The levels of complexity and interpretation of grading at three levels seem adequate and appropriate for the management of complex cases.					
23	The team intervention criteria for specialized teams according to the level of complexity seem adequate and appropriate for the management of complex cases.					
	HEXCOM-BASIC					
24	HexCom-Basic as a tool for comprehensive assessment of needs and resources can favourably improve care for people with advanced illness and/or end-of-life illness.					
25	HexCom- Basic offers information in a clear and visual way.					
26	The format of HexCom- Basic is adequate in terms of letter type, measurement and distribution of information in space.					
27	The distribution of information in the grid of HexCom- Basic facilitates it being filled in easily.					
28	The content of HexCom- Basic is adequate in terms of its extent.					
29	The explanatory drafting for each area of systemic resources in HexCom- Basic is clear enough and understandable for people not specialized in palliative care.					
30	The levels of strength and interpretation of the three-level grading proposed in HexCom-Basic seem adequate and appropriate for the assessment of the resources and strengths of the patient/family.					

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31	The number of systems with a high level of strength seems a good indicator of the strength of the patient/family.					
32	The criterion proposed in HexCom- Basic that three or more systems with high strength can reduce the final complexity by one level seems adequate.					
	HEXCOM-CLIN					
33	The HexCom-Clin as a tool for the comprehensive assessment of needs and resources for specialized teams trained in its use can favourably affect the improvement of care for people with advanced illness and/or end-of-life illness.					
34	HexCom-Clin offers information in a clear and visual way.					
35	The format of HexCom-Clin is adequate in terms of letter type, measurement and distribution of information in space.					
36	The distribution of information in the grid of HexCom-Clin facilitates it being filled in easily.					
37	The content of HexCom-Clin is adequate in terms of its extent.					
38	The explanatory drafting for each sub-area of needs and resources of HexCom-Clin is clear enough and understandable for people not specialized in palliative care.					
	HEXCOM-FIGURE					
39	HexCom-Figure as a tool for the comprehensive assessment of needs and resources for specialized teams trained in its use can favourably affect the improvement of care for people with advanced illness and/or end-of-life illness.					
40	HexCom-Figure offers information in a clear and visual way.					
41	The format of HexCom-Figure is adequate in terms of letter type, measurement and distribution of information in space.					
42	The distribution of information in the grid of HexCom-Figure facilitates it being filled in easily.					
43	The content of HexCom-Figure is adequate in terms of its extent.					
44	The explanatory drafting for each sub-area of needs and resources of HexCom-Figure is clear enough and understandable for people not specialized in palliative care.					
45	HexCom-Figure as a tool for the comprehensive assessment of needs and resources for specialized teams trained in its					

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	use can favourably affect the improvement of care for people with advanced illness and/or end-of-life illness when incorporating the initial and final evaluation, after release.					
	HEXCOM-PATIENT					
46	HexCom-Patient as a interview guide for comprehensive assessment of needs and resources of patients can favourably improve care for people with advanced illness and/or end-of-life illness.					
47	HexCom-Patient offers information in a clear and visual way.					
48	The format of HexCom-Patient is adequate in terms of letter type, measurement and distribution of information in space.					
49	The distribution of information in the grid of HexCom-Patient facilitates it being filled in easily.					
50	The content of HexCom-Patient is adequate in terms of its extent.					
51	The explanatory drafting for each area of needs and resources of HexCom-Patient is clear enough and understandable for people not specialized in palliative care.					
52	The sections with which the information is distributed are appropriate.					
53	The questions formulated compile the main contents to understand the needs and resources/strengths of the patient.					
54	The questions are formulated in a clear and understandable language so that they can be understood by the patient.					
55	Collecting the perception of the passage of time is useful in order to have a global approach on the experience of suffering by the patient.					
56	The indications of the NOTE of not doing the interview if there is denial, refractory existential anguish, delirium or cognitive impairment seem appropriate.					
57	Introducing two open questions to understand the main problem and what is most helpful to the patient favours empathy with them and can help give more appropriate indications.					
58	Grading the discomfort as low, medium, or high and its equivalence with VAS seem adequate and appropriate, and it may be useful for complementing the interview.					
59	The strength gradation as a little, quite a lot, a lot, and its equivalence with inverse VAS seems adequate and appropriate, and it may be useful for complementing the interview.					

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	HEXCOM TRANSLATION					
60	The Spanish version of the different instruments is the same as the original Catalan sense.					

[1]SD= Strongly disagree D= Disagree I=Indifferent A=Agree SA=Strongly agree

Appendix B: Modifications to the documents based on the responses of the group of experts

Model (Items 2–15)
The word "changing" is introduced in relation to needs (Item 3).
Comprehensibility for non-specialists is reviewed (Item 13).
Not included are:
A sub-system of cultural beliefs and values in macro-system. This is justified above all because of the need for simplicity and it is considered that these are included as "values" in the micro-system and in the meso-system community bonds (Item 6).
Grade need in 4 levels. Justified so as not to break the initial model (Item 7).
HexCom-Red (Items 16–23)
"and/or end of life" added in the title (Item 16).
The word "Discomfort" is added to improve comprehensibility (Item 21).
The concept of "unadaptative emotionality" (intense, persistent emotion, which interferes with relationships and functionality), "rigid personality trait" (not adaptable to change) and "denial of the LDS" (unadaptative) (Item 21) is explained.
Not included are:
Put more space to specify the needs that cause discomfort. Justified by the need for simplicity (Item 19).
HexCom-Basic (Items 24–32)
Emphasis is placed on the intuitive and non-mathematical character of the final complexity balance "In principle, consider if more than half of the systems with high strength (H) could reduce the level of final complexity by one...) (Item 32).
Not included are:
Reduce the examples of systemic strengths. Justified by the comprehensibility of some little known concepts (Item 29).
Modify the explanatory text for the strength systems, since there are no alternatives (Item 29).
Grade the strengths the opposite way around. Justified to highlight precisely this opposite effect of the strengths (Item 30).
Prioritize the micro-system. Justified by the need to consider all areas of strength alike (Item 30).
HexCom-Clin (Items 33–38)
The list of risk criteria for mourning is removed. Justified by the extension and because this instrument is for specialists (Item 37).
HexCom-Figure (Items 39–45)
The affiliation data in the central space is removed and the type is made larger (Item 41).
Instructions on how to fill it in are included on the back (Item 44).
HexCom-Patient (Items 46–59)
Notes. New note about the need for a link and to respond to emerging needs (Item 46).
Informal verb forms are maintained, for the primary need of creating a bond (Item 46).
In the psycho-emotional area, "what degree of discomfort would you say" is substituted for "to what degree" (Item 51).
In the "passing of time" area "with which you would relate" replaced by "with what" (Item 51).
A note is placed on the limits of the question about the passage of time, which sometimes discriminates the ability to diversify attention and sources of gratification rather than suffering (Item 55).
The VAS scales are included in the initial version (Items 58 and 59).
Not included are:
The consideration of changing the words sustaining and breaking in the spiritual sphere. Justified by the same concept of spiritual discomfort: biographical breakdown relates to lack of meaning and relational failure with lack of connection (Item 51).
Translation into Spanish (Item 60)
The questions are put right, "they produce discomfort" is added, and the psycho-emotional text is changed (Item 60).
Notes:
A review is made of the formal aspects, fonts, spaces and distribution by an external person outside the coordinating group and a graphic designer reviews all the instruments (Items 18, 28, 35, 41, 48, 49 and 50).
The formal and content changes are passed from one instrument to the other.

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