**Additional file 2. *Process evaluation methods based on UK MRC guidance on process evaluations of complex interventions (Moore et al., 2015)***

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| **Dimension and subdimension** (definition by Moore et al. 2015) | **Outcomes and indicators (I)**  If no level is indicated the indicator is applicable across levels or no specific level | **Data collection**  each outcome/indicator can be evaluated qualitatively or quantitatively using one or more data-collection methods, see corresponding letters | **Timing**  (T0: baseline, T1: 3 months, T2: 7 months) |
| **Implementation *(****the structures, processes and resources through which delivery is achieved, and the quantity and quality of what is delivered)* | | | |
| **1. How delivery is achieved** *(the structures, processes and resources through which delivery is achieved)* | | | |
| **1.A. Structures** (how the intervention activities were implemented) | **(a) description of how the intervention activities were implemented per family**:  I1: location of ACP conversations  I2: order of activities implemented, and how those were implemented  I3: who was present during the ACP conversations  I4: whether and how information is transferred to paediatric oncologist  I5: whether the facilitator had contact with the family in between/after ACP sessions, how (e.g. modes of communication) and about what  I6: whether the facilitator used extra exercises during the ACP, how and why | **(a1)** To measure I1-6, facilitators will complete a structured diary  **(a2)** Semi-structured individual interviews with facilitators | **(a1)** Throughout the data collection period after each facilitated ACP conversation with a patient and/or family  **(a2)** Intermediate (every 6 months) and post data collection period |
| **1B. Resources** | **(b) Time investment facilitators**  **I1:** Time spent on training  **I2:** Time spent by facilitator on preparation of intervention activities  **I3:** Time spent by facilitators on delivery of the intervention activities | **(b)** To measure I1-3, we will use specific questions in the structured diaries to keep track of time spent on preparation and delivery of key ACP activities (cf. conversations) | **(b)** monthly by facilitators, throughout data collection period |
| **2. What is delivered (***the quantity and quality of what is delivered)* | | | |
| **2A. Dose** (*how much intervention/the quantity of what is delivered)* | **(c) Amount of intervention activities delivered per family**  I1: number of ACP activities held per family  I2: number of topics discussed and not discussed during the conversations | **(c1)** To measure I1-I2 we will ask facilitators to complete a structured diary  **(c2)** To measure I2 we will audiotape ACP conversations | **(c1)** Throughout the data collection period after each facilitated ACP conversation with a patient and/or family  **(c2)** Each ACP conversation held is ideally audiotaped (after informed consent of participants) |
| **2B. Reach** *(extent to which a target audience comes into contact with the intervention)* | **(d) Number of eligible families approached by facilitator, and proportion of families included in total**  I1: number of adolescents involved  I2: number of parents involved  I3: average ratio adolescent: parent | **(d)** Trial monitoring | **(d)**Throughout the study |
| **2C. Fidelity** *(consistency of what is implemented with the planned intervention)* | **(e) activities delivered as intended:**  I1: number of activities delivered as intended  I2: order of intervention activities delivered as planned  **(f) content of ACP conversations delivered as intended**  I1: number of ACP conversation sessions in which *(all, half, less than half -* of the topics were discussed | **(e)** To measure I1-2 we will ask facilitators to complete a structured diary  **(f)** To measure I1 we will audiotape ACP conversations; we will use the pre-structured checklist based on conversation manuals to check fidelity (we aim to select 8 families who have participated in all 4 BOOST pACP conversations, from whom we will analyse all 4 conversations. We intend to include dyads from different hospitals and with adolescents from different age categories) | **(e)** Throughout the data collection period after each facilitated ACP conversation with a patient and/or family  **(f)** Each ACP conversation held is ideally audiotaped (after informed consent of participants) |
| **2D. Adaptations** *(alterations made to an intervention in order to achieve better conceptual fit)* | **(g) Type of adaptations made in intervention activities** (as described by manual)  **(h)** **Type of adaptations made in intervention activities per hospital** | **(g1)** Facilitators complete a structured diary  **(g2+h)** Semi-structured individual interviews with facilitators  **(h)** Semi-structured individual interviews with paediatric oncologists (n = 8) | **(g1)** Throughout the data collection period after each facilitated ACP conversation with a patient and/or family  **(g2)** Intermediate (every six months) and after the data collection period.  (**h)** After 12 months and after data collection period |
| **2E. Quality** *(the quality of what is delivered)* | **(i) Perceived quality of the ACP conversations** | **(i)** Semi-structured interviews with adolescent and parent(s) separately (n=10) | **(i)** Post-intervention maximally two months after the last ACP session |
| **Mechanisms of impact** *(the intermediate mechanisms through which intervention activities produce intended (or unintended) effects/how intervention activities, and participants’ interactions with them, trigger change)* | | | |
| **1. Responses and interactions** *(how participants interact with the intervention)* | **(j) Level of satisfaction about the intervention as a whole and the different components**  **(k) Perceived benefit and relevance of the intervention/value placed on the intervention** | **(j1+k1)** Semi-structured interviews with adolescent and parent(s) separately (n=10)  **(j2+k2)** Semi-structured individual interviews with paediatric oncologists(n=8)  **(k3)** Semi-structured interviews with facilitators | **(j1)** Post-intervention maximally two months after the last ACP session  **(j2)** after 12 months and post data collection period  **(k3)** every 6 months and post-intervention |
| **2. Mediators** *(intermediate processes which explain subsequent changes in outcomes)* | **(l) Evaluation of perceived mediators:**  I1: the extent to which BOOST has contributed to more knowledge about ACP  I2: more positive attitude on ACP  I3: better self-efficacy in ACP  I4: a higher intention to communicate on ACP themes  I5: improved communication between …  adolescent, parent(s) and healthcare professionals | **(l1)** Semi-structured interviews with adolescent and parent separately (n= 10)  **(l2)** Semi-structured interviews with facilitators  **(l3)** Semi-structured interviews with paediatric oncologists (n = 8) | **(l1)** post-intervention (in adolescents/parents, maximally two months after the last ACP session)  **(I2)** every 6 months and post-intervention  **(I3**) after 12 months and post-intervention |
| **3. Unanticipated pathways or consequences** | **(m) + (n)** Potential unanticipated consequences of the BOOST pACP program in adolescents, parents (per family) and in oncologists, teams, hospital wards (whether the intervention led to other changes) | **(m)** Semi-structured interviews with adolescent and parent separately (n = 10)  **(n)** Semi-structured interviews with paediatric oncologists(n = 8) | **(m)** post-intervention (in adolescents/parents, maximally two months after the last ACP conversation of the family)  **(n)** after 12 months and post-intervention |
| **Context** *(factors external to the intervention which may influence its implementation, or whether its mechanisms of impact act as intended / how external factors influence the delivery and functioning of interventions)* | | | |
| **1. Contextual moderators** | **(o) + (p)** Contextual barriers that inhibit/facilitators that facilitated pACP implementation and/or effectiveness (eg. skills, attitudes, or organisational norms, culture (human, financial, resources) | (o1+p1) Semi-structured interviews with adolescent and parent separately (n = 10)  (o2+p2) Semi-structured interviews with facilitators  (o3+p3) Semi-structured interviews with paediatric oncologists (n=8) | **(o1 ,p1)** post-intervention (in adolescents/parents)-, maximally two months after the last ACP conversation of the family)  **(o2+p2)** every 6 months and post-intervention  **(o3 + p3**) after 12 months and post-intervention |
| **2. Intention for maintenance** *(extent to which the program is intended to be part of routine organisational practice and policy)* | **(q) + (r)** Intention of adolescents/parents/healthcare professionals to conduct ACP conversations (or other BOOST pACP activities) in the future | (q) Semi-structured interviews with adolescent and parent separately (n = 10)  (r) Semi-structured interviews with paediatric oncologists(n=8) | **(q)** post-intervention (in adolescents/parents)-, maximally two months after the last ACP conversation of the family)  **( r)** after 12 months and post-intervention |