**Supplementary appendix**

**Adherence barriers to inhaled medicines in elderly Japanese patients with asthma evaluated using the “Adherence Starts with Knowledge 20”**

**(ASK-20) questionnaire**

**Supplemental Table 1. Characteristics in selected inhaled medicines by physicians between older and young adults**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Selected inhaled medicines** | **Total**  **(n = 251)** | **Older**  **(n = 138)** | **Younger**  **(n = 113)** | **p value** |
| Compounds, n (%) |  |  |  |  |
| ICS monotherapy | 49 (19.5) | 25 (18.1) | 24 (21.2) | 0.6 |
| ICS/LABA combination therapy | 202 (80.5) | 113 (81.9) | 89 (78.8) | 0.6 |
|  |  |  |  |  |
| Devices, n (%) |  |  |  |  |
| Dry powder inhalers | 217 (86.5) | 117 (84.8) | 100 (88.5) | 0.5 |
| Diskus® | 127 (50.6) | 74 (53.6) | 53 (46.9) | 0.3 |
| Turbuhaler® | 82 (32.7) | 43 (31.2) | 39 (34.5) | 0.6 |
| Ellipta® | 5 (2.0) | 0 (0) | 5 (4.4) | 0.0176\* |
| Twisthaler® | 3 (1.2) | 0 (0) | 3 (2.7) | 0.1 |
| pressured-Metered dose inhalers | 34 (13.6) | 21 (15.2) | 13 (11.5) | 0.5 |
|  |  |  |  |  |
| Regimens, n (%) |  |  |  |  |
| No. of administration per day |  |  |  |  |
| 2 times | 233 (92.8) | 133 (92.4) | 100 (88.5) | 0.0247\* |
| 1 time | 18 (7.2) | 5 (3.6) | 13 (11.5) | 0.0247\* |
| Dose per one administration |  |  |  |  |
| 4 puffs | 4 (1.6) | 0 (0) | 4 (3.5) | 0.0399\* |
| 3 puffs | 6 (2.4) | 4 (2.9) | 2 (1.8) | 0.7 |
| 2 puffs | 60 (23.9) | 35 (25.4) | 25 (22.1) | 0.7 |
| 1 puff | 181 (72.1) | 99 (71.7) | 82 (72.6) | 1.0 |

**Notes:** All data were expressed as number (%) of patients. \* p < 0.05 between older and younger adults

**Supplemental Table 3. Comorbid diseases between older and young adults**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Comorbid diseases** | **Total**  **(n = 251)** | **Older**  **(n = 138)** | **Younger**  **(n = 113)** | **p value** |
| Hypertension | 97 (38.6) | 73 (52.9) | 24 (21.2) | <0.0001\* |
| Cardiovascular diseases | 20 (8.0) | 17 (12.3) | 3 (2.7) | 0.0047\* |
| Coronary diseases | 10 (4.4) | 9 (6.5) | 2 (1.8) | 0.1 |
| Heart failure | 7 (2.8) | 6 (4.4) | 1 (0.9) | 0.1 |
| Arrhythmia | 3 (1.2) | 3 (2.2) | 0 (0) | 0.3 |
| Digestive ulcer or Gastroesophageal reflex diseases | 93 (37.1) | 54 (39.1) | 39 (34.5) | 0.5 |
| Dyslipidemia | 69 (27.5) | 42 (30.4) | 27 (23.9) | 0.3 |
| Chronic or seasonal rhinosinusitis | 53 (21.1) | 24 (17.4) | 29 (25.7) | 0.1 |
| Diabetes | 38 (15.1) | 23 (16.7) | 15 (13.3) | 0.5 |
| Osteoporosis | 29 (11.6) | 24 (17.4) | 5 (4.4) | 0.0013\* |
| Insomnia | 28 (11.2) | 18 (13.0) | 10 (8.9) | 0.3 |
| Anxiety | 20 (8.0) | 13 (9.4) | 7 (6.2) | 0.5 |
| Psychosis (Depression, bipolar disorders, schizophrenia) | 19 (7.6) | 9 (6.5) | 10 (8.9) | 0.6 |
| Gout or Hyperuricemia | 14 (5.6) | 11 (8.0) | 3 (2.7) | 0.1 |
| Rheumatoid arthritis or Collagen vascular diseases | 14 (5.6) | 10 (7.3) | 4 (3.5) | 0.3 |
| Benign prostate hypertrophy | 10 (4.0) | 8 (5.8) | 2 (1.8) | 0.2 |
| Chronic kidney diseases | 8 (3.2) | 7 (5.1) | 1 (0.9) | 0.1 |
| Cerebrovascular diseases | 7 (2.8) | 4 (2.9) | 3 (2.7) | 1.0 |
| Liver cirrhosis or Chronic hepatitis | 7 (2.8) | 6 (4.4) | 1 (0.9) | 0.1 |
| Any malignancies | 6 (2.4) | 5 (3.6) | 1 (0.9) | 0.2 |
| Any minority diseases | 18 (7.2) | 10 (7.2) | 8 (7.1) | 1.0 |

**Notes:** All data were expressed as number (%) of patients.In any malignancies, three patients had, elderly patients (number of patients) had breast cancer (3), prostate cancer (1) and systemic cancer with unknown–origins (1), whereas young and middle-aged patients had prostate cancer (1). In any minority diseases, elderly patients had Hashimoto’s disease (3), overactive bladder (3), Basedow’s disease (2), chronic pancreatitis (1) and myasthenia gravis (1), whereas young and middle-aged patients had Basedow’s disease (2), diabetes insipidus (1), endometriosis (1), Hashimoto’s disease (1), myasthenia gravis (1), overactive bladder (1) and Parkinson’s disease (1). \* p < 0.05 between older and younger adults

**Supplementary Table 3. Odds ratios of each item on barriers to inhaled medicines between older and younger adults by univariate and multivariate analyses**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **item** | | **Univariate analyses** | |  | **Multivariate analyses** | |
| **Odds (95%CI)** | **p value** |  | **Odds (95%CI)** | **p value** |
| Q1. | I just forget to take my medicines some of the time | 0.69 (0.41, 1.14) | 0.2 |  |  |  |
| Q2. | I run out of my medicine because I don’t get refills on time | 0.53 (0.23, 1.18) | 0.2 |  |  |  |
| Q3. | My use of alcohol gets in the way of taking my medicines | 3.89 (1.03, 14.7)a  0.26 (0.07, 0.97)b | 0.0394† |  | 3.91 (1.02, 15.1)a  0.26 (0.07, 0.99)b | 0.0475† |
| Q4. | I worry about how medicine will affect my sexual health | 0.34 (0.10, 1.15) | 0.1 |  |  |  |
| Q5. | I sometimes forget things that are important to me | 1.34 (0.70, 2.58) | 0.4 |  |  |  |
| Q6. | I have felt sad, down, or blue during the past month | 0.49 (0.16, 1.55) | 0.3 |  |  |  |
| Q7. | I feel confident that each one of my medicines will help me | 1.38 (0.32, 5.90) | 0.7 |  |  |  |
| Q8. | I know if I am reaching my health goals | 0.88 (0.52, 1.48) | 0.7 |  |  |  |
| Q9. | I have someone who I can call with questions about my medicines | 1.71 (0.95, 3.07) | 0.1 |  |  |  |
| Q10. | I understand my doctor’s/nurse’s instructions about the medicines I take | 5.29 (1.16, 24.1) | 0.0243\* |  | 3.33 (0.69, 16.1)b | 0.1 |
| Q11. | My doctor/nurse and I work together to make decisions | 3.49 (1.59, 7.67) | 0.0011\* |  | 2.94 (1.31, 6.61)b | 0.0091\* |
| Q12. | I am able to read and understand labels | 1.71 (0.67, 4.39) | 0.4 |  |  |  |
| Q13. | Takingmedicines more than once a day is inconvenient | 0.56 (0.31, 1.01) | 0.1 |  |  |  |
| Q14. | I have to take too many medicines a day | 1.02 (0.56, 1.85) | 1.0 |  |  |  |
| Q15. | It is hard for me to I have to take | 0.47 (0.16, 1.33) | 0.2 |  |  |  |
| Q16. | Taken amedicine more or less often than prescribed? | 2.31 (1.32, 4.04)a  0.43 (0.25, 0.76)b | 0.0033† |  | 2.31 (1.32, 4.06)a  0.43 (0.25, 0.76)b | 0.0035† |
| Q17. | Skipped or stopped taking amedicine because you didn’t think it was working? | 0.49 (0.16, 1.55) | 0.3 |  |  |  |
| Q18. | Skipped or stopped taking medicine because it made you feel bad? | 0.98 (0.29, 3.30) | 1.0 |  |  |  |
| Q19. | Skipped, stopped, not refilled, or taken less medicine because of the cost? | 0.41 (0.04, 4.53) | 0.6 |  |  |  |
| Q20. | Not hadmedicine with you when it was time to take it? | 0.44 (0.19, 1.00) | 0.1 |  |  |  |

**Notes:** The odds ratio (95% confidence interval, p value) for each item was calculated on the basis of comparison between populations of patients who had barriers with older and younger adults. a younger to older adults; b older to younger adults. \* p <0.05 when compared with younger adults; † p < 0.05 when compared with older adults.

**Supplementary Table 4a. Odds ratios of each item on barriers to inhaled medicines among older adults between poor and good adherence to inhaled medicines**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **item** | | **Univariate analyses** | |  | **Multivariate analyses** | |
| **Odds (95%CI)** | **p value** |  | **Odds (95%CI)** | **p value** |
| Q1. | I just forget to take my medicines some of the time | 5.15 (2.11, 12.6) | 0.0003\* |  | 4.43 (1.77, 11.1) | 0.0014\* |
| Q2. | I run out of my medicine because I don’t get refills on time | 1.53 (0.38, 6.19) | 0.7 |  |  |  |
| Q3. | My use of alcohol gets in the way of taking my medicines | 2.00 (0.18, 22.9) | 0.5 |  |  |  |
| Q4. | I worry about how medicine will affect my sexual health | 0.00 (n/a) | 0.6 |  |  |  |
| Q5. | I sometimes forget things that are important to me | 1.09 (0.39, 3.01) | 1.0 |  |  |  |
| Q6. | I have felt sad, down, or blue during the past month | 6.48 (1.03, 40.9) | 0.1 |  |  |  |
| Q7. | I feel confident that each one of my medicines will help me | 0.98 (0.11, 9.14) | 1.0 |  |  |  |
| Q8. | I know if I am reaching my health goals | 0.76 (0.31, 1.88) | 0.7 |  |  |  |
| Q9. | I have someone who I can call with questions about my medicines | 1.65 (0.69, 3.92) | 0.3 |  |  |  |
| Q10. | I understand my doctor’s/nurse’s instructions about the medicines I take | 1.35 (0.34, 5.34) | 0.7 |  |  |  |
| Q11. | My doctor/nurse and I work together to make decisions | 1.43 (0.56, 3.66) | 0.5 |  |  |  |
| Q12. | I am able to read and understand labels | 1.67 (0.48, 5.77) | 0.5 |  |  |  |
| Q13. | Takingmedicines more than once a day is inconvenient | 1.60 (0.59, 4.29) | 0.4 |  |  |  |
| Q14. | I have to take too many medicines a day | 1.19 (0.45, 3.14) | 0.8 |  |  |  |
| Q15. | It is hard for me to I have to take | 0.00 (n/a) | 0.4 |  |  |  |
| Q16. | Taken amedicine more or less often than prescribed? | 3.31 (1.33, 8.23) | 0.0169\* |  | 2.41 (0.92, 6.36) | 0.1 |
| Q17. | Skipped or stopped taking amedicine because you didn’t think it was working? | 6.48 (1.03, 40.9) | 0.1 |  |  |  |
| Q18. | Skipped or stopped taking medicine because it made you feel bad? | 4.28 (0.82, 22.5) | 0.1 |  |  |  |
| Q19. | Skipped, stopped, not refilled, or taken less medicine because of the cost? | n/a | 0.2 |  |  |  |
| Q20. | Not hadmedicine with you when it was time to take it? | 1.77 (0.43, 7.31) | 0.4 |  |  |  |

**Notes:** The odds ratio (95% confidence interval, p value) for each item was calculated on the basis of comparison between populations of patients who had barriers with poor and good adherence to inhaled medicines. \* p < 0.05 poor versus good adherence.

**Abbreviation:** n/a, not available

**Supplementary Table 4b. Odds ratios of each item on barriers to inhaled medicines among younger adults between poor and good adherence to inhaled medicines**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **item** | | **Univariate analyses** | |  | **Multivariate analyses** | |
| **Odds (95%CI)** | **p value** |  | **Odds (95%CI)** | **p value** |
| Q1. | I just forget to take my medicines some of the time | 13.1 (4.50, 37.9) | <0.0001\* |  | 6.88 (1.94, 24.4) | 0.0028\* |
| Q2. | I run out of my medicine because I don’t get refills on time | 5.36 (1.76, 16.4) | 0.0054\* |  | 3.13 (0.82, 12.0) | 0.1 |
| Q3. | My use of alcohol gets in the way of taking my medicines | 0.67 (0.13, 3.42) | 1.0 |  |  |  |
| Q4. | I worry about how medicine will affect my sexual health | 5.70 (1.33, 24.4) | 0.0177\* |  | 7.34 (1.15, 46.6) | 0.0346\* |
| Q5. | I sometimes forget things that are important to me | 3.91 (1.38, 11.1) | 0.0112\* |  | 0.65 (0.17, 2.55) | 0.5 |
| Q6. | I have felt sad, down, or blue during the past month | 0.80 (0.15, 4.16) | 1.0 |  |  |  |
| Q7. | I feel confident that each one of my medicines will help me | 5.10 (0.45, 58.2) | 0.2 |  |  |  |
| Q8. | I know if I am reaching my health goals | 1.00 (0.43, 2.34) | 1.0 |  |  |  |
| Q9. | I have someone who I can call with questions about my medicines | 0.82 (0.29, 2.32) | 0.8 |  |  |  |
| Q10. | I understand my doctor’s/nurse’s instructions about the medicines I take | 0.00 (n/a) | 1.0 |  |  |  |
| Q11. | My doctor/nurse and I work together to make decisions | 0.00 (n/a) | 0.1 |  |  |  |
| Q12. | I am able to read and understand labels | 0.97 (0.18, 5.26) | 1.0 |  |  |  |
| Q13. | Takingmedicines more than once a day is inconvenient | 2.37 (1.00, 5.60) | 0.1 |  |  |  |
| Q14. | I have to take too many medicines a day | 0.93 (0.35, 2.49) | 1.0 |  |  |  |
| Q15. | It is hard for me to I have to take | 0.58 (0.12, 2.89) | 0.7 |  |  |  |
| Q16. | Taken amedicine more or less often than prescribed? | 5.62 (2.33, 13.5) | <0.0001\* |  | 2.67 (0.88, 8.04) | 0.1 |
| Q17. | Skipped or stopped taking amedicine because you didn’t think it was working? | 1.50 (0.34, 6.67) | 0.7 |  |  |  |
| Q18. | Skipped or stopped taking medicine because it made you feel bad? | 3.90 (0.62, 24.5) | 0.1 |  |  |  |
| Q19. | Skipped, stopped, not refilled, or taken less medicine because of the cost? | 0.00 (n/a) | 1.0 |  |  |  |
| Q20. | Not hadmedicine with you when it was time to take it? | 6.17 (2.05, 18.6) | 0.0011\* |  | 4.14 (1.08, 15.9) | 0.0384\* |

**Notes:** The odds ratio (95% C confidence interval, p value) for each item was calculated on the basis of comparison between populations of patients who had barriers with poor and good adherence to inhaled medicines. \* p < 0.05 poor versus good adherence.

**Abbreviation:** n/a, not available